Gas Journal

VOL. 295. 110th YEAR. LONDON, SEPTEMBER 24, 1958. No 4967. PRICE 1/6

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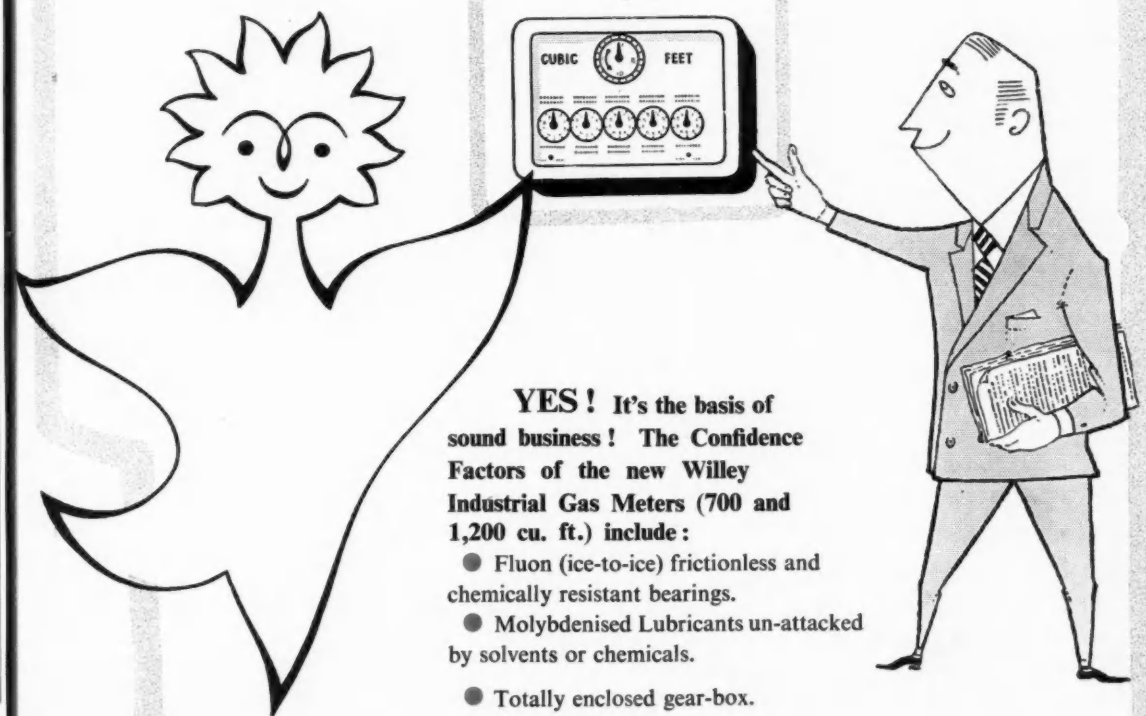

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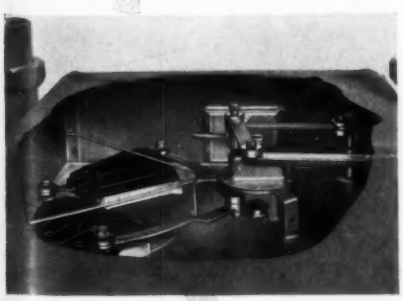

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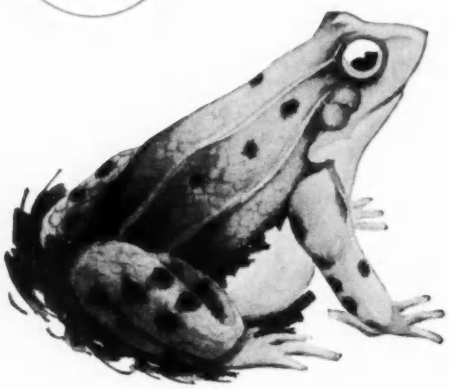

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Gas Journal

VOL. 295 NO. 4967 SEPTEMBER 24, 1958

110TH YEAR

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illustration by courtesy of H. E. Wingfield & Co.

something in common

They remind one of different worlds, the 1d. black postage stamp of 1840, and the modern T.G. meter. Yet, they *have* something in common—both are the products of true craftsmanship. First issued on 6th May, 1840, the 1d. black was printed by Perkins, Bacon & Co. from an engraving by Frederick Heath. The design was based on a watercolour by Henry Corbould from the City Medal engraved by William Wyon, and is presented as a fine example of the engraver's art. The T.G. meter epitomizes craftsmanship and the T.G. 'G' prepayment mechanism is accepted as the most modern precision movement on the market.

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Gas Journal

VOLUME 295. No. 4967 SEPTEMBER 24, 1958. 110th YEAR

Coal and World Energy

IN spite of the increasing prominence of other forms the importance of solid fuel to the general contribution to world energy remains. We are, therefore, publishing this week a review of the papers on coal read to the section on Thermal Energy of the World Power Conference, recently held in Montreal, which is of considerable interest since it is seldom possible to present a world picture of so important a basic industry. It is unfortunate that no mention was made of the solid fuel position in either the United States or China, information from both of which would have made the picture even more complete. The 12 papers presented do, in fact, cover nine countries and four continents, and it is largely to the credit of the General Reporter, Professor E. A. Allcut of the University of Toronto, that it is possible to gain a reasonable idea of the world's situation in regard to coal.

Although a great deal is heard of the expansion of the use of oil and natural gas, it may sometimes be forgotten what a very large contribution solid fuel still makes to energy supplies throughout the world. In Australia, for instance, where there are no oil or anthracite reserves and only small supplies of hydro-electric energy amounting to 6.5% of the power demands, the economy is very largely dependent on coal. The annual demand of 22 mill. short tons consists mostly of bituminous coal and to a smaller extent of brown coal from Victoria.

The position in Canada is complicated by both the size of the country and the location of industry in relation to coal mining areas. With industry concentrated in the central provinces and coal mining to the east and west, it is more convenient to import what coal is needed from the United States. This state of affairs seems to be changing with the proving of the large oil and natural gas deposits in Alberta. With the laying of the transcontinental gas main, domestic markets are being connected to gas supplies. The railways at the same time are being converted to diesel traction. In spite of this tendency, large solid fuel electric power stations are being built which are likely to increase the demand for coal. In Europe, a considerable amount of coal is imported by France from the United States to meet her energy shortages. In Germany, the expanding economy is making heavy demands on energy which are expected to be met by an expansion of the hard coal industry. In India, hydro-electric plants account for 45% of the total generating capacity, the remaining 55% being from thermal stations, most of which use coal; by 1975, however, the present demand of 40 mill. tons of coal per annum is likely to have increased to 300 mill. tons. In Japan the draining of methane from mines on a large scale is making deep mining both more economical and safer. It has been calculated that this has reduced the consumption of ventilating air by 50% as well as providing a valuable fuel and a raw material for the chemical industry. Other countries such as Poland and the U.S.S.R. are making every effort to expand coal supplies. In the latter country this is most significant. In 1913, her energy demands were the equivalent of 39 mill. tons of coal, by 1956 these had risen to 429 mill. tons, with coal accounting for 86% of her total energy production.

The problem of ever increasing energy demands is world-wide and, as the review points out, in spite of increasing use of oil and natural gas, more solid fuel will be needed in the future, if these demands are to be met. More efficient mining methods will be needed and the rate of coal extraction will have to be increased by more extensive mechanisation. Less waste and better utilisation of existing supplies are equally essential. Mechanisation has been greatly developed in Great Britain since the war, but many of our coal seams are thin, some less than 3 ft., and faulting makes the life of many mechanised coal faces short. Open-cast coal mining has been extended in many countries, but the quality of the coal won by this means is inferior. The immediate result of mechanisation is to produce more small coal, which is largely unusable unless special means are devised for its combustion or low cost briquetting processes are perfected for its use in conventional domestic grates or industrial plant. The extended use of pulverised fuel in thermal power stations and other steam raising plant in Great Britain

is most significant, with an increase from 3.1 mill. tons in 1931 to 27.9 mill. tons in 1955. Its use has involved the fitting of grit arrestors and electrical precipitators to prevent atmospheric pollution.

In countries apart from Great Britain, greater use has been made of high ash coals for industrial purposes to enable high grade bituminous coals to be freed for uses for which they are best fitted. The processing of brown coals and lignites for the production of gas, and on further processing, liquid fuels is being developed as shown by the Lurgi plants at Sasol in South Africa and Morwell in Australia.

All such developments seem small and insufficient really to deal with the future demands for energy. The large natural gas deposits recently discovered at Lacq, in France, or the oil deposits in the Sahara would, it seems, be likely to make a very important contribution to energy supplies in Europe in the immediate future, but the review continues to stress that any such energy sources are likely to be exhausted before the solid fuel reserves are worked out: All present and future increases in demand will, then, be ultimately satisfied by solid fuel. This is, we think, showing rather an excessive loyalty to solid fuel, but undoubtedly some source of low grade energy will have to be developed to allow coal, oil and natural gas to be used more as chemical raw materials than to be squandered in the production of heat alone.

Incorporated Plant Engineers

THE recent transfer of the headquarters of the Institution of Incorporated Plant Engineers from Birmingham to London demonstrates the increasing importance of this branch of engineering.

The Institution, now 12 years old, was founded after the Second World War to continue the informal meetings that had taken place during the war, between engineers in charge of the large American excavators imported for open-cast coal working. These meetings, which had as their object the exchange of information and mutual assistance in the working of these open-cast sites, had so justified their existence as to make it desirable that they should be continued within the organised framework of an Institution. The scope of such an Institution could naturally cover a much wider field of industries and its aims were to include industrial, municipal and Service establishments together with civil engineering projects, research and education.

The response to the founding of the present Institution was immediate and within a year branches, holding monthly meetings, had been formed in seven large towns throughout Great Britain, including London. By 1954 their number had increased to 18, which included an overseas branch in Bombay. Membership had grown equally fast from 120 at the end of 1946 to 4,000, more than 500 of whom are overseas, spread through most countries in the world.

What is the express purpose of this Institution and why should it have such an enthusiastic following?

The Institution seeks to serve professional engineers whose interest is in plant *utilisation* rather than plant design and manufacture. Until its formation no such separate institution had existed, and with the growing complexity of modern plant and the increased cost both of its installation and maintenance, the need for some means for the exchange of information on its most efficient use became vital. The importance of plant engineering as a branch of the more traditional forms of engineering is likely to increase. The output of a possible 'automatic' or 'nearly automatic' factory will be so great and so inter-dependent on the individual pieces of plant installed, that a breakdown is likely to be very costly in loss of production. The engineer in charge of any such plant, or of many existing plants in the most modern factories, must be highly competent and possess a background of sound knowledge and experience, together with a highly flexible mental outlook. He must be able to adapt himself quickly to the rapid changes in the type of equipment of which he is in charge. The type of engineer needed for such tasks does not come under the categories represented by the old-established engineering institutions; nor should he be a gifted fitter who with intelligence, hard work and a sense of responsibility has risen to take charge of costly plant. The plant engineer must be properly trained, able thoroughly to understand the technology of the machines he is in charge of and be in a position to suggest improvements in design from his practical experience of machine utilisation.

The other object of the Institution is, then, to organise training courses for young men taking up this branch of engineering and to establish professional standards of competence by the holding of examinations. With this end in view, a course on plant engineering has been started at the City and Guilds of London Institute. It is noteworthy that in the syllabus for this course, it is expressly made clear to the student that he must approach each main subject as a user of plant and must be prepared to spend a third of the available time in the laboratory or workshop.

The setting up of the new headquarters in London will help to organise the Institution on a national basis and do much to establish its members as a recognised branch of professional engineers.

ENGINEERING DRAWING

A NEW specially abridged, low-priced version of B.S. 308, 'Drawing Office Practice' will be welcomed by technical students and their tutors. B.S. 308A (inclusion of the suffix is important when ordering copies) is intended for students who are in the early stages of an engineering education. Although priced at only 4s. 6d. less one-third students' discount this 40-page publication contains much of the 'solid meat' of the complete edition of B.S. 308. Each page of the abridged version carries a cross-reference to the equivalent page of the parent edition.

B.S.I. expects a big demand for 308A, whose parent volume (B.S. 308, 10s. 6d.) is in the best seller class, with sales of nearly 50,000 copies since 1953, and a reputation as the authorised textbook on drawing practice. Copies of B.S. 308A may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1.

Personal Notes

MR. T. P. W. NORRIS, lately Chief Personnel Officer of the Vickers Group, previously Labour Manager of I.C.I. Billingham Division, and a former President of the Institute of Personnel Management, has been appointed Deputy Chairman by George Kent, Ltd. MR. R. E. HANDFORD, Deputy Managing Director, will, on October 1, after 45 years in the Company's service during 25 of which he was a Director, relinquish his executive functions and retain his seat on the Board; while MR. W. A. HARTOP, who joined the Company in 1927 and was appointed to the Board in 1943, has been appointed Managing Director: Commander P. W. Kent, formerly Chairman and Managing Director, remains as Chairman. MR. W. GUY ARDLEY, who joined the Firm in 1893, became a Director in 1914 and was Joint Managing Director from 1938-1956 has retired, as also has MR. LESLIE H. KENT, who joined the Company in 1913, and the Board in 1915, and continued as an Executive until 1945.

MR. T. LIONEL JONES, Service Manager of the South Wirral District (Chester and Ellesmere Port) of the North Western Gas Board, is to retire at the end of the month. On the formation of the Board, he was appointed District Service Manager in Chester, taking over his present appointment in 1956.

DR. M. J. F. OLDEN will succeed DR. ARTHUR MARSDEN as Area Scientist to the South Western Gas Board on the latter's retirement at the end of the month. Dr. Olden, at present Dr. Marsden's Deputy, became Deputy Engineer and Manager, Stafford District, West Midlands Gas Board, in 1951 and took up his present post in 1955.

MR. D. OXLEY, foreman in the constructional shop of Robert Dempster & Sons, Ltd., for 10½ years, has retired after 46 years' service; and MR. ERNEST RAWNSLEY, template maker, has retired after 56 years' service.

MR. R. YEOMAN has been appointed General Manager of the foundries of James Hodgkinson (Salford), Ltd., who recently acquired Bennis Combustion, Ltd., and J. & J. Neil (Temple), Ltd.

MR. A. P. M. PURDON has been appointed Operations Study Manager in charge of central operational research and work study for the British Oxygen Co., Ltd.

MR. S. LANGFORD is to relinquish his position with Robert Dempster & Sons, Ltd., on September 30.

Diary

September 25.—NORTH THAMES G.C.C.: Westminster City Hall, Charing Cross Road, W.C.2. Council Meeting.

October 2.—INCORPORATED PLANT ENGINEERS (SOUTHERN SECTION): Polygon Hotel, Southampton. Discussions: 'Safety Precautions,' led by A. Simmonds, and 'Preventive Maintenance,' led by F. V. Woods. 7.30 p.m.

October 2.—WALES AND MON. JUNIORS (S. WALES SECTION): Chepstow. Paper on 'Changes in Developments,' by T. E. Tyrrell.

October 2-5.—PURCHASING OFFICERS' ASSOCIATION: Southport. Conference and 'Minibition.'

October 3.—LONDON AND SOUTHERN JUNIORS: Westminster Technical College, Vincent Square, S.W.1. Opening Meeting of new Session and Presidential Address.

October 4.—WALES AND MON. JUNIORS (N. WALES SECTION): Llangefni. Chairman's Day.

October 7.—INCORPORATED PLANT ENGINEERS (EDINBURGH BRANCH): 25, Charlotte Square. 'District Heating,' by G. E. H. Lewis. 7 p.m.

October 7.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster. Meeting at 11 a.m.

October 7.—MIDLAND JUNIORS: Staff Mess Room of the Birmingham District, West Midlands Gas Board. Opening meeting of Session with Presidential Address. 6.30 p.m.

World's biggest well

A NATURAL gas well, believed to be one of the biggest in Canada—possibly the world—is reported to have been struck in the Berland River area of Alberta, about 155 miles north-west of Edmonton.

Although no official announcement has yet been made by the oil companies working the area, the well is reliably reported to have a daily open flow potential of 1,500 mill. cu.ft. of gas.

Obituary

MR. HARRY S. BROOM, Founder, Chairman and Joint Managing Director of Broom & Wade, Ltd., has died after a short illness. Thanks to character, courage and sound engineering and business sense, coupled with inspiring leadership, his business grew from small beginnings in 1898 to a world-wide organisation with subsidiary companies in South Africa, Australia and Canada at the time of his death.

MR. S. F. GARDINER, who was District Manager of the Chelmsford undertaking of the Eastern Gas Board, has died aged 52, following an operation.

MR. WILFRID HANSON, who until his retirement in 1946 had been for 48 years on the staff of Robert Dempster & Sons, Ltd., has died aged 77.

Suggestion schemes

The Industrial Welfare Society has established a new service to industry: Suggestion scheme posters published at regular intervals at 2s. 6d. each. The posters are 15 in. wide by 20 in. deep—large enough to be read at a distance, but small enough to go on a works notice-board. They are screen printed in two, three, four, and five colours on stout paper.

Long service

Another 33 employees of the South Eastern Gas Board have been presented with awards after 40 years' service in the industry. The Chairman of the Board, Mr. W. K. Hutchison, who made the presentations at Croydon recently, said that 1,998 such presentations had now been made by the South Eastern Gas Board since nationalisation.

New Whessoe engineering division

WHESSOE, LTD., is regrouping departments concerned with design, tendering and development to form an engineering division. This new division will parallel the existing works and erection divisions which are concerned with shop fabrication and site construction, and it will comprise three engineering groups, each of which will embrace all staff and activities associated with a range of related products.

The storage group will deal with tanks and storage installations for petroleum products and all other liquids, including low temperature liquefied gases; vapour conservation equipment, including floating roofs; and tank fittings and gauges, including the Shand & Jurs range.

The pressure vessels group will handle shop built pressure vessels to all codes; large site built vessels including spheres, bullets and fractionating columns; wind tunnels and nuclear reactor pressure vessels.

The chemical engineering group will be responsible for the traditional Whessoe range of gas treatment plant; heat exchangers; active carbon plants; and general chemical engineering plant and processes.

Senior appointments are—Manager, Engineering Division, Mr. R. F. Bishop; Chief Storage Engineer, Mr. D. S. Hudspeth; Chief Engineer, Pressure Vessels, Mr. R. W. Horseman; and Chief Chemical Engineer, Mr. J. Thompson. Within the Engineering Division Mr. N. Felps and Mr. R. Frith will continue to hold the posts of Chief Estimator and Chief Draughtsman respectively.

Sc.G.B. to take 6 mill. cu. ft. of gas a day from iron and steel works

AN important new source of gas supply to meet the demands of domestic consumers and the rapidly growing requirements of industrial consumers in Lanarkshire and the West of Scotland was officially inaugurated on Monday by Mr. D. D. Burns, Deputy Chairman of the Scottish Gas Board, and Mr. R. P. Towndrow, Director of Colvilles Ltd., at the Ravenscraig works of Colvilles.

As the result of an agreement between Colvilles and the Board, Ravenscraig works will supply 6 mill. cu.ft. of gas per day for distribution in the West of Scotland grid, and provision has been made for the supply of larger quantities as Ravenscraig develops.

While the Board have been receiving supplies of gas from coke ovens for some time, Ravenscraig is the first integrated iron and steel works in Scotland which has been designed from its inception to include facilities for making supplies of coke oven gas available to the gas industry.

Distribution

At Ravenscraig unpurified gas is piped from the coke ovens to the booster installation, where large electrically-driven machines deliver it through the 5¼ miles of 18-in. cast iron main to the Board's works at Uddingston. Before leaving Ravenscraig the rich coke oven gas is diluted by the addition of blast furnace gas to the required calorific value. The resultant gas is purified at Uddingston and then passed into the Lanarkshire grid system for distribution to consumers.

Since both the steel and the gas industries depend upon securing adequate supplies of good quality coking coal, substantial economies in the use of this basic indigenous fuel can be achieved by such an arrangement as has now been made. The amount of coal required to produce 6 mill. cu.ft. of gas a day by orthodox carbonisation is approximately 360 tons. The immediate annual saving of good quality coking coal which will result from this new source of gas supply is, therefore, in the region of 130,000 tons.

The total cost of laying the main between Ravenscraig and Uddingston and installing equipment for handling the new supplies of coke oven gas was £130,000.

No gas for them

The North Eastern Gas Consultative Council at its September meeting in Leeds under the Chairmanship of Alderman H. Sutcliffe, expressed concern that gas was not to be laid on to the new housing estate at Featherstone, near Pontefract, where the local authority has installed solid fuel appliances in the houses but declined to pay towards the cost of a gas supply. There are no gas mains on the estate.

Dutch gas leak detector now being manufactured in Glasgow

GIVING his presidential address at the opening meeting of the new session of the Scottish Western Junior Gas Association in Glasgow recently, Mr. George B. Scott, Glasgow and Western Division, referred to leakage detection surveys, and recalled that he was present at the first series of such surveys carried out by the Scottish Gas Board.

They were conducted by a Dutch firm of pipeline engineers, which had perfected a method of systematically probing the ground directly over the main at 6-ft. intervals. This type of instrument was now being manufactured in Glasgow, and considerable numbers had been purchased.

These instruments had to be calibrated to a particular gas, and he believed that models which could discriminate between two gases—for example, town gas and sewer gas—by switching to an alternative circuit were now being produced, said Mr. Scott. He then outlined the method of operation and detailed the most advantageous formation of the leak detection team.

Initial figures, he said, indicated that the cost per mile surveyed was about £20. The cost per leak located varied considerably from district to district; figures had been between £2.3 and £27.

It was expected that initial surveys would take longer and produce more escapes than future surveys. A frequency of the order of three or four years appeared to be reasonable, but results might disprove this.

Weymouth to close

Weymouth gasworks is to cease gas manufacture on November 1. Employees at the works and trade union representatives were informed of the Board's decision on September 5. After November 1, Weymouth will be supplied with gas from the Board's Poole works.

Redoubled efforts

Britain is to double her efforts in the sphere of harnessing thermonuclear power for industrial uses, and expects by 1970 to be producing electricity at a cost of between 0.45d. and 0.5d. per unit from power stations burning uranium, it was announced at the International Atoms for Peace Conference.

Coke works closed

Otto Vale coke works, Blaydon, Co. Durham, were closed down at the end of August, but most of the displaced men are being absorbed at other coking plants or into other industries. It was announced in June by the Durham Divisional Coal Board that the Blaydon works were to be closed because of falling demand for coke.

Plant Engineers

The Education Committee of Incorporated Plant Engineers announce that the next of their comprehensive refresher courses for senior works and plant engineers is to be held this winter at Liverpool University. It will comprise 18 weekly lectures on Thursday evenings beginning on October 30.

Featuring Mr. Therm on the farm

Gas Council plans for the Dairy Show

THE use of gas on the farm, in the farmhouse, and in the rural homes of farmworkers, will be the theme of The Gas Council's adjacent stands at the 1958 Dairy Show at Olympia from October 21-23.

Water heating in the dairy and the home will be the principal theme, and there will be a 'domestic corner' where household gas appliances—for cooking, water heating, and refrigeration—will be displayed.

Gas and coke farm appliances will be displayed in the form of photographs; these will include equipment designed for the treatment of by-products and grain and grass drying.

A new technical handbook issued by The Gas Council will make its début at the show, and will be available at The Gas Council stands. Dealing with coke-fired crop drying plant, it has been produced to give some information which may be instructive and useful to those interested in grain, grass and barn hay drying.

With the Eastern Junior Gas Association in London

HUMAN RELATIONS STUDY URGED

Presidential address by Mr. W. F. Pritchard

A PLEA that the Eastern Junior Gas Association should encourage all its members to study human relations was made in his presidential address to the Association by Mr. W. F. Pritchard in London on September 13.

'The management aspect of human relations is a subject in which practice is of much greater value than book studies, and that is where the value of this Association comes in,' Mr. Pritchard continued Holding office in the Association was an excellent way in which a young man could gain experience in human relations. If more eagerness were shown in filling these offices, it would be not only a good thing for the individual but also for the Association.

Value to Authors

Contrary to what some members might think, far greater value was obtained by the author of a paper than by his audience. For this reason he put in a special plea for more and still more volunteers from members of the Association to read papers, and gave suggestions to authors preparing their first paper, ending with the advice:

'Ensure that your method of presentation receives careful consideration, particularly with regard to simplicity, logical sequences and readability.'

On the value of discussion, Mr. Pritchard continued: 'Since so much of our time and energies are absorbed in discussion with our fellow men, it is well to gain experience in this aspect of the administrative function as early as we can. Particularly so, in that the higher we rise as administrators, and most engineers aspire to managerial posts, the more do we become engaged in negotiation and conciliation with our workpeople.'

Returning to his main theme—human relations and the engineer—the President said that no matter how effectively the industrial relations in any industry was operated, unless the human relations at local establishment level was operating smoothly between manager and managed the effective working of the organisation must be seriously impaired.

The factors which affected human relations between the members of an establishment were communications, assurance of one's place within the organisation, and proper appreciation of one's personal failings and idiosyncrasies.

On communications he elaborated: 'Since there are numerous levels of management, depending on the size of the organisation, and the gas engineer usually finds himself, at any rate during the earlier part of his career in the middle strata, he must necessarily consider his relationships both up as well as down the line of command. Any defection in either direction will be equally fraught with consequences detrimental both to himself and the efficiency of the establishment he controls.

'To be effective, communications require basically the establishment of mutual confidence between the persons concerned, followed by a mutual awareness of "what," "when," and "how" to communicate. The first must be established right at the beginning, and the second must be carefully cultivated by experience. In the case of the third, there is scope for theoretical instruction, and much is being done by industry effectively to train its personnel in this important subject.

Communications

'The means of communication normally used are, the telephone and its accessories, the letter or internal memorandum and the spoken word, either between individuals or groups.

'Telecommunications are continually increasing in popularity and usefulness . . . However, we must remember that none of them can outmode the human voice or the written word.

'To communicate effectively by the written word requires both time and careful thought . . . The basic things to remember are that our recipients are as busy as we ourselves and will appreciate our correspondence much more if it is clear and concise. The little extra time that we spend in clarifying our thoughts and pruning our words will be well repaid in the saving of further unnecessary correspondence to clear up the doubts raised by our previous obscure efforts.

'Writing has the advantage of permanence . . . Frequently, however, the time factor is important, and it is here that a telephoned advice, confirmed in writing, is necessary and proper. Where the subject is involved the personal interview becomes increasingly advantageous.'

Mr. Pritchard then dealt with the various means whereby knowledge of the organisation was to be obtained and turned to the question of the assurance of one's place within the organisation:

'No one will deny the importance of proper selection as the principal factor in human relations, and it is for this reason that the author welcomes each and every new investigation which has been carried out on this important subject.

'One thing is certain and that is the necessity for adopting a standard by which each applicant can be judged. Considerable practice is required in training one's mind to reject all irrelevant data and to sift and evaluate the data related to the particular standard which has been accepted for the type of post in question.'

On the subject of an understanding of the opportunities for promotion, the President said the 'progress urge' was usually of greater importance than the pay packet. There was, however, a tendency for potentially sound supervisors to be held back by lack of training in responsibility.

But the General Post Office had an arrangement, which other organisations had begun to copy, of building up a holiday and sickness reserve staff of supervisors from among the more promising youngsters. When the potential supervisors and managers so recruited were posted to fill temporary vacancies in other districts a careful record was kept of their stewardship and this proved invaluable in filling managerial appointments as and when they became vacant.

Difficult Subject

A proper appreciation of one's personal failings and idiosyncrasies was a difficult subject. We must be prepared to turn an introspective and impartial eye upon ourselves, something difficult for the frankest and humblest of us.

Following the meeting, members and their wives were entertained to luncheon and subsequently to a river cruise of London Docks, by invitation of the Eastern Gas Board and Sir John W. Stephenson, C.B.E., Chairman of the Board, in whose absence on holiday the Chair was taken by Mr. J. H. Dyde, O.B.E., Deputy-Chairman.

New Premises

British Arca Regulators, Ltd., are to move on October 6 from 34, Millbank, London, S.W.1, to Sisson Road, Gloucester, where all administrative functions, and the manufacture of light engineering products will be carried out. The works at Ledsam Street, Birmingham, will, at present, continue the manufacture of all heavy equipment.

House Beautiful

The October number of *House Beautiful*, to be the largest issue ever, will be a whole house heating number. It will deal with such items as open fires, hot water systems whether using gas or other fuels, and radiation siting.

Clean Air in North

The West Riding clean air campaign is being organised by the Solid Smokeless Fuels Federation.

Despite mechanisation output of pits was lower last year than in 1951—N.C.B. chief

'NO subject could be more appropriate at this time than that which forms the theme of this year's Summer School—"Coal and the Consumer,"' said Sir James Bowman, Chairman of the National Coal Board, to the Board's Summer School at Oxford, recently. The past year has been a time of great change for the coal industry and coal trade of this country.

A study of the trends of productivity and costs showed that for the first five years following nationalisation, the industry, though inheriting very grave difficulties, had made good progress, continued Sir James. Production had risen steadily, so that in 1951 the rate of deepmined output from N.C.B. mines at 209.5 mill. tons, was 30 mill. tons higher than at vesting day, while output per man year rose from 261 to 304 tons.

'Since then, however, the picture has been in marked contrast. Whatever the causes, the truth is that we have seen the advances of earlier years replaced by a hard and constant struggle to maintain the level of output already won—a struggle in the main unsuccessful—indeed, we have lost ground. Despite all the money spent on modernisation and mechanisation, the total output from N.C.B. mines in 1957, and the output per man year, were less than in 1951!

'The outstanding significant feature of the present situation in the somersault we have experienced in the sudden decline in demand which, first apparent last year, is still continuing. The drop in home demand in 1957 amounted to 5 mill. tons, compared with an expected increase of 2 to 3 mill. tons. The decline has continued and grown far more serious in many respects this year.

'The recession in industrial production, particularly in steel and other heavy coal and coke using industries has had a marked effect on demand. In my address to the annual conference of the National Union of Mineworkers I said the decline in home demand alone may well amount to 7 mill. tons this year compared to last, but the position now appears to be that the fall in demand may well exceed 8 mill. tons!

'When we turn to exports we find an equally difficult situation. Changes in the level of industrial demand for coal have not been confined to this country—nor is such a situation to be expected. Our competitors on the Continent are, in fact, in a very serious position, for Continental importers have a heavy importing programme of American coal as a result of commitments entered into at a time—not so long ago—when our home demand was outstripping supply.

'Thus, there is a surplus of coal on the Continent, and stocks at collieries in Germany alone, for example, as now as high as 6½ mill. tons, ten times higher than a year ago. As you can imagine, therefore, an attempt to re-enter our former export markets on the Continent at this time is exceptionally difficult.

'And, although we have had some individual successes both in Europe and elsewhere, in the face of fierce competition from other exporting countries, particularly Poland, the fact is that we are finding it very difficult to maintain our exports at last year's figure. We are making some headway, however, and certainly it will not be for lack of effort if the results are disappointing. The fact is that advances in this field can only be built up progressively over a period of time.

'Looking ahead, we can and must plan for a return to conditions of expansion. Unfortunately, this is not the whole story so far as we are concerned. The truth is that over a very wide range of our markets we are meeting sustained and increasing competition from oil.

'Already oil has made very great advances in those markets where it is in competition with coal. From 1953 to 1957 its use increased to the extent of 7½ mill. tons of coal equivalent. What is perhaps even more significant is the rate at which this growth is accelerating, even in the face of the overall decline in industrial activity at home!

More Oil Used

'Thus, for example, whereas the inland consumption of coal has decreased this year by 3½ mill. tons compared with the corresponding period of 1957 and nearly 7 mill. tons compared with 1956, the consumption of oil has increased by 5 mill. tons (57%) and 4½ mill. tons (43%) respectively! This year the figures have been even more striking as a result of the oil conversion programme of the Central Electricity Generating Board.

'Only a few years ago the coal industry was unable to meet the demands of the home market, and we were importing many millions of tons from overseas. At that time the Government advised the Central Electricity Authority to enter into agreements with the oil companies for the development of oil-fired power stations.

'The programme which was subsequently drawn up provided for the consumption of oil equivalent to 9 mill. tons of coal by 1956. Though this has since been reduced to 6 mill. tons as a result of the greater availability of coal, the latest published figures show that in the first six months of this year power stations consumed oil equivalent to about 1½ mill. tons of coal. Moreover, you will all be aware that surplus oil production capacity has brought about an even more intense competitive element within the oil industry itself.

'The tremendous progress of oil in the home market has been strengthened this year by price reductions, first in February and then in April. Indeed, over the last few years the trend in the price of fuel oil compared with the price of coal has been such that in some fields it tends to become a more and more formidable competitor.

'Today we are confronted with really serious financial difficulties—the inevit-

Coal utilisation research reviewed in B.C.U.R.A. publication

DEVELOPMENTS in coal utilisation research during 1957-58 were reviewed by Dr. W. Idris Jones in his presidential address to the annual general meeting of the British Coal Utilisation Research Association and reported in B.C.U.R.A. *Quarterly Gazette* No. 34, recently published.

The President said the need to alleviate the increasing shortage of large coal by the greater use of smaller and sometimes inferior coals had actuated much of the work of the Association during the year—he described a number of research projects that were in train.

In addition, basic research at Leatherhead had probed deeper into the fundamental nature of coal; progress had been made in the estimation of quinone groups in coals, the chemical investigation of the plastic softening of coals during coking, the production of fluorocarbon oils from coal, the study of the structure of industrial carbons, and the application of radioactive tracers in fuel research.

Featured in the *Gazette* is an article describing the work of the Association's analytical laboratories. The function of these laboratories is to supply to the various research departments detailed information concerning the materials that they handle. Several thousand samples are analysed annually; in addition to coals these include coal extracts and tars, smokeless fuels, chars, metals, minerals, coal ash, slags, boiler deposits, catalysts, boiler waters, and flue and fuel gases. The preparation of truly representative samples is acknowledged to be the basis of successful analysis, and an outline of the method used in coal sample preparation is given. Both well-established and less-familiar analytical techniques are employed, and these are described.

The latter methods include spectrophotometry, X-ray diffraction, microanalysis, and the determination of slag viscosity by means of a specially-developed apparatus. Reference is also made to a recently-developed rapid procedure for determining mineral constituents in coal ash, slag and boiler deposits.

able outcome of a developing situation over the last seven years—and with a formidable problem of disposals, coupled with intense competition for available markets, circumstances completely new to this industry under public ownership. As in any other industry, wages must be paid, materials must be bought, and getting the money to do this depends on the sale of our products. At the same time, essential development and reconstruction work must be pressed forward and paid for.

Challenge the Market

'The essential feature of the present situation is that we must do all we can to maintain and improve our competitive position so as to form a firm platform on which our marketing staff can go all out to meet the new problems and challenge of the market. Now, more than ever, our operating results, so largely dependent as they must be upon the level of efficiency and productivity which we can attain, are of crucial importance, for upon them in turn depends the economic health of the industry and the extent to which we can carry forward the progressive policies which have been of such importance to the industry since vesting date.

'There are some who would argue that, because of undistributed stocks of coal, now 13 mill. tons, we can relax our efforts so far as productivity is concerned. I know of no greater error in the assessment of the present situation. The Board's stocking programme has been one of the most essential elements in our policy to gain much needed flexibilty of operation.

'In circumstances such as those at present stocks help us to gain a very valuable margin of flexibility. In an industry such as ours, to try exactly to match production with demand in all circumstances and at all times would be extremely dangerous, even if it were possible.

'In an extractive industry like coal-mining, it is not a quick or simple matter to reduce our production capacity with every change in the level of demand. It is even more difficult to increase that capacity, or to build it up again once it is lost. The fact is that stocking coal has helped us very considerably in our efforts to meet this extremely difficult situation, to help ensure security and continuity of employment by the sharing of the problem among the various divisions.

'Unfortunately, however, although invaluable in helping to cushion the impact of the recession in demand and in providing a much needed "resilience" in case of a sudden future increase, stocks have not by themselves been an adequate means of coping with the present situation.

'The special measures the Board have taken—the cessation of Saturday working, the national control of recruitment which was imposed as a temporary measure and which has since been lifted, the closing of a limited number of excessively uneconomic workings—all have been specifically designed to reduce total output in keeping with the lower level of demand while ensuring the minimum hardship to those in the industry. The requirements of the rapidly changing situation demanded nothing less than purposeful and effective action if we were to avoid very serious consequences to the industry and all who work in it.

Reduce Costs

'But, having taken these immediate steps, now more than ever we must do all we can to ensure our place in the fuel markets at home and abroad. Now more than ever is the need to hold or reduce our costs as far as possible by reaching the very highest level of efficiency. And please note that I am preaching better performance to do this, not any other method. The fact is that stocks make it more, not less, necessary to achieve the utmost efficiency and economy of operation.

'There no longer exists a situation in which we are urged to produce every single ton of coal irrespective of cost. Today we are fighting for markets in the face of increasing competition.

'The security of the men in the industry is not at hazard because of stocks on the ground. Our security will be more at hazard—indeed, only at hazard—by a failure on our part to recognise the real nature of this problem, to ensure our ability to compete in the existing markets and to extend and re-enter others wherever possible. This, I stress to management and men, depends upon our ability to remain competitive, to improve our position wherever we can, and this, more than anything else, depends in the immediate sense not so much on high level planning and investment policy but application in the co-operation of management and men in the day-to-day tasks at the pit.

'If ever we were on test, all of us in this industry, it is today, and if ever I felt the need to urge and advise co-operative endeavour it is in this testing, difficult period, when all our efforts must be concentrated on safeguarding our advances. There can be no "star" in this act. No one-sided effort can hope to succeed. It behoves all concerned to make a go of it.

'On the one hand, we have been criticised for not holding a gigantic "bargain" sale of our stocks. Bearing in mind the causes of the present situation and the nature of the stocks, which are mostly small coal, the effect of such a course in increasing the use of small coal is highly problematic

'On the other hand, we have been criticised recently for trying to dispose of them in the export market at competitive prices below those in the home market. It is not my purpose in this address to deal with the many questions to which criticism of this kind gives rise.

'Suffice it to say that the Board believes it necessary to take every reasonable opportunity to re-enter the export markets, not in the face of "dumping," but against the fair give and take of competition, and I know of no way to do this in the conditions which exist today than to "sell competitively".

Successful Measures

'For years we have sold to the British industrialist at prices much lower than his competitor in Europe could buy, and at a time, be it remembered, when we could so easily have sold this same coal in the export market at a premium of up to 40s. a ton—to the vastly greater profit of the Board, but to the detriment of industry—maybe full employment—at home.

'I have said very little about measures already in hand, designed, for example, to encourage the use of the smaller sizes of coal and deflect demand away from large coal, still in short supply; to increase the supply of large coal to meet the gap caused by the decision to end imports. In fact our measures have already succeeded in halting, and indeed reversing, the decline in the proportion of large coal produced. This drive is one of the most urgent tasks in the field of production.

'The Board are in fact taking action according to a comprehensive policy covering all the main fields of operation to ensure that our products meet the essential requirements of consumers in the more exacting circumstances of today. Except in certain specialist processes, the economics of coal versus oil is still in favour of coal, although the balance is now so delicate in some industries that it will require all our efforts to maintain, and, if possible, improve it.'

How the N.C.B. could help solve its domestic coal problems

ADDRESSING the Co-operative Society's summer school at Loughborough recently, Mr. A. C. Hazel, Managing Director of Hurseal, Ltd., said there was a way in which the National Coal Board could help solve its domestic coal problems.

Mounting stocks, the mining of less large coal and decreasing demand from a public turning to other forms of domestic heating was all leading to a crisis which the Board itself could do much to forestall: If greater use were made of efficient free-standing open fires with restricted throats, part of the problem would be solved.

Mr. Hazel said that in spite of the efforts of two or three manufacturers who had pioneered the free-standing convector open fire, approximately 1 mill. old-fashioned open fires were sold last year. Against this, the number of efficient convector fires sold by all manufacturers totalled only about 100,000.

If the N.C.B. wanted the use of solid fuel to be continued in our homes with the maximum efficiency, it should 'preach the gospel' on really efficient fires.

WORLD PROSPECTS FOR COAL

Following the colourful opening ceremony of the World Power Conference at Montreal on September 7, the 1,200 delegates got down to business on the following day with the first technical session—on Hydraulic Energy. September 9 brought the important section on Thermal Energy, which was subdivided into Coal, Oil and Gaseous Fuels, and Nuclear Energy and Nuclear Fuel. This review is concerned only with the subdivision on coal, and it is suggested that in view of the gas industry's close relationship to, and dependence on, this traditional fuel, the variety of papers on the subject presented to the Conference, providing as they do an all too rare world picture of the coal industry, will be of considerable interest to 'GAS JOURNAL' readers.

Its contribution to thermal energy assessed by a review of papers to the World Power Conference

IT should be explained at the outset that the papers presented in each subdivision of a main subject—in this case there were 12—were summarised collectively by a General Reporter. In the section dealing with the contribution of coal to thermal energy the General Reporter was Professor E. A. Allcut, of the University of Toronto, and this review has been largely abstracted from his extremely competent summary.

As Professor Allcut pointed out, the extent of the possible contribution of nuclear fission to the solution of this problem was not clear and, at the present time, it must be regarded as essentially in the post-experimental stage of development.

This implied that the fossilised fuels, principally coal and oil, would be the main standby for some years to come and, as these were not replaceable they would inevitably become scarcer and more expensive. Moreover, the tendency to substitute natural oil and gas for coal in applications such as heating and railway work, must necessarily increase their rate of exhaustion and accelerate the ultimate transfer of demand back to solid fuels. It was imperative, therefore, that the reserves of solid fuel be conserved, as far as possible, by appropriate use and by the elimination of waste. In the past, these principles had been honoured more in the breach than in the observance; high grade fuels had been used where the cheaper and more abundant low grade fuels would suffice, inefficient combustion processes had been widely employed and valuable by-products had been thrown away. A discussion of the economics of the solid fuel situation therefore, was timely and, accordingly, 12 papers on this subject were presented at the conference, from nine different countries and four continents.

Professor Allcut dealt first with Australia whose economy was largely dependent on coal, as far as fuel and power were concerned for, in 1956-57 (apart from road transport), bituminous coals supplied 58.5% of the demand, the annual production being 22 mill. short tons (2,000 lb.). Of this amount, about 30% was used for electric power generation and the other 70% was divided equally between steel and railways (35.2%) and gas making and industrial uses (34.3%) respectively. The future rate of bituminous coal producion was uncertain, as this was largely dependent on other developments. About 9.5% of the power was supplied by brown coal, mostly in Victoria. There were no oil or anthracite reserves, little water power (6.3%) and no early development of atomic power was discernible.

The situation in Canada was complicated by the fact that the large industrialised centres were mostly located in the central provinces and the coal bearing areas were in the east and west, respectively. For this reason, in 1956, about 64% of the coal used in Canada was imported, as also was 45% of its oil consumption. In 1946, the railways accounted for 29% and household heating for 31% of the solid fuel consumption, but these markets had been largely taken over by liquid and gaseous fuels. It was expected that, with the completion of the large steam generating stations that were now being built, the consumption of coal would be considerably increased, but those in Ontario, at least, would be mostly supplied from the United States. Increasing quantities of coke would also be required by the expansion of the iron and steel industries.

France imported a considerable amount of coal, particularly from the United States, but did export a small amount for use in the European coal and steel industries. The economic planning of capital investment, interest rates, production and stockpiling were therefore being given special attention.

Germany had a rapidly expanding economy, which required a corresponding increase in energy production, to which the hard coal industry was expected to make the largest contribution. In the mining industry itself, the internal consumption of coal was formerly about 10% of the coal produced, but it was anticipated that this figure would be reduced by burning low grade coals in large efficient power plants.

For many years, Great Britain had traditionally been dependent on coal for heating, industrial and power plant work but, as the coal reserves and man power became scarcer, more mechanisation became necessary in the mines and interest in nuclear fission became more intense. (The paper on British practice to which Professor Allcut was referring was 'The Mechanisation of Coal Winning in Great Britain' by Mr. H. A. Longden, Director-General of Production, National Coal Board.)

Existing hydro-electric plants in India accounted for about 45% of the total generating capacity, the other 55% being supplied by thermal plants, most of which used coal. It was probable that the demand for coal would increase by 1975 from the present 40 mill. tons to some 300 mill. tons per annum. The reserves of coking coals are estimated to be 2,000 mill. tons and those of low grade, non-coking coals at about 40,000 mill. tons, plus some lignite. Also, by 1975, the demand for high quality coals for railways and metallurgical work is expected to reach 80 mill. tons per annum. Thus, the rate of consumption of the better grades of coal must be reduced, partly by substitution and by the elimination of small inefficient plants.

The draining of methane from the coal measures in Japan was stated to make deeper mining economical, to reduce the consumption of ventilating air by one half, to increase mine safety and to conserve a valuable natural resource for heating and chemical purposes.

Poland was also studying the use of high ash brown coals as an economic measure. Bituminous coals constitute 77.5% of the energy resources of that country and this procedure would reduce internal consumption and would release more of the bituminous coal for export purposes. The brown coals constituted about 9.2% of the energy reserves, but their calorific values were low.

The U.S.S.R. was also experiencing a great increase in the demand for energy this had risen from the equivalent of 39 mill. tons of coal in 1913, to 498 mill. in 1956. The actual coal production in 1913 was 29 mill. tons and, in 1956, this had risen to 429 mill. tons, so that coal now provided about 86% of the total energy production.

Mechanisation

Having dealt with the subject of location and transportation, Professor Allcut pointed out that the most significant factors in this regard were the rapidly increasing importance of mechanisation, the adoption of open cut or strip mining, the growing application of electric drives and of improved methods of roof support. He later summarised Mr. Longden's account of mechanisation in British mines as follows: 'The characteristics of British coals make the application of mechanisation far from simple but, since 1947, this has been increasing on account of rising demands, higher costs and shortage of man power. The coals are hard in texture and the seams are fairly flat, but the average life of a face is short because of the prevalence of faulting. About 23% of the output is derived from seams that are less than 3 ft. thick and, in many spots, they are less than 2½ ft. in thickness. Working depths exceeding 1,500 ft. occur in about 30% of the seams and weak roofs and soft floors are prevalent.

By 1955, a range of machines had been proved in a variety of conditions and had been manufactured in sufficient numbers to make possible an intensive drive toward mechanisation. Consequently, the proportion of the total output from mechanised mines rose from 2.5% in 1947, to 23% in 1957 and it is expected to be 29% by 1958. Output per man-shift rose from 6.34 (short) tons in 1948 to 6.65 in 1954. It fell, temporarily to 6.39 tons in 1957, but this was attributed to inexperience.

A percussive machine has been devised for use in hard seams and mechanisms have been used in seams as little as 20 in. thick. The use of machines is stated to be the greatest single cause of degradation in coal size, but its general effect is considered to be less than that of the other operations, such as short-firing and handling. Method study, operational research and standard costing are being employed in the modernisation process and 700 more coal cutters were used in 1956 than in 1947. The number of compressed air machines fell, while the number of electrically operated machines rose. The extent of the movement toward mechanisation is indicated by the fact that, in 1956, 88% of the deep-mined coal was mechanically cut, as compared with 75% in 1947.

Increased Production

Turning to mechanisation in other countries, Professor Allcut remarked that in Poland, the mechanisation of mines and the working of thinner, dirtier seams, gave increasing proportions of coal fines and intermediate gravity products from cleaning plants. Increased production had been achieved in the U.S.S.R. by concentrating on the more important deposits and by mechanisation of the coal and peat industries. Strip mining now accounted for 20% of the output. The general trend appeared to be increasingly toward the local use of the poorer grades of fuel, either in the raw state or after beneficiation or washing, the replacement of small, inefficient power plants by large, modern installations and the recovery of by-products and wastes.

In Australia, gas making and coking coals were frequently used as general purpose coals. About one-third of the coking coals in New South Wales were washed before use, but the coke was relatively high in ash content and low in shatter strength; the greater use of lower grade iron ores would require a better quality of coke.

The proportion of low grade coal used internally in the German mining industry was likely to increase and, by 1970, it might be as high as 24 mill. tons per annum. These coals might contain about 30% ash and up to 40% water, which was reduced to 18 or 20% before use. Larger boilers, continuous operation and modern techniques made possible efficiencies of 90 to 92%. Also, economy and flexibility might be increased by the interconnection of the various steam, electric and air systems and by combination with the chemical industries. The greater use of methane for heating purposes also helped to conserve coal.

By means of these and other devices it was considered that the internal fuel consumption of the mining industry might be reduced from the present 7-7.3% of the output to 3 or 4%, and it was predicted that, in the course of

the next 12 years, an extra 6 mill. tons per annum might be freed for external use, as compared with 1955-56.

India also must supplement her limited resources of high grade coals by using more low grade fuels, which contained from 15 to 30% ash and about 15% of moisture. This procedure might involve either beneficiation or liquefaction, or both for, in 1920, the average ash content for an output of 18 mill. tons was 15%, by 1953, this had already risen to 20% for an output of 35 mill. tons and the trend seemed likely to continue. Some of the coals contained 35 to over 40% of ash and these fuels called for suitably designed combustion and disposal systems.

Special Equipment

In Poland it was noted that, for coals having more than 40% ash content, the market price decreased at a greater rate than the reduction in heating value and this fact encouraged the design of special equipment suitable for use with low grade fuels. A formula was presented which took into account the influences of the various factors relating to the economic feasibility of cleaning coal and examples of its application indicated that, in specific cases, the cleaning of coal containing less than 26% of ash was uneconomical for power production. The desirability of continuous operation of the boilers, when low grade fuels were burned was reflected in the assumed operating time of 7,000 hours per year (19.2 hours per day), but the assumed overall thermal efficiency of 34.4% appeared to be rather high and that predicted for operation on bituminous coals was higher still. However, the comparison between the two fuels was probably not invalidated thereby.

The possibility of draining methane from the coal measures and using it for the production of heat and power was mentioned in several of the papers, but was discussed in detail in the communication from Japan, where some of the coal measures contain considerable amounts of free and adsorbed methane. The total known reserve of this gas was estimated to be 25.5 bill. cu.ft. and it might ultimately reach 13 to 14 times that figure, or 50 times Japan's estimated reserve of natural gas. The present annual loss of methane to the atmosphere in the ventilating air was serious, being about 42,400 mill. cu.ft. In 1934, this gas was first used as a boiler fuel but, later, it was supplied to the chemical industry, about 13% of the total production of methane being so consumed in 1957. It was employed in the manufacture of chemicals such as prussic acid, ammonium sulphate, methanol, carbon black and acetylene.

The new plans envisaged the consumption of 45% of the annual output for chemical purposes. Formulæ were given in the paper for calculating the extent of methane reserves and three main methods of extraction were described. Automatic regulation of the density of the gas was also discussed and it is stated that, at Takamatsu, the methane was transported to the chemical factory, a distance of 4½ miles, at a pressure of 35½ in. of water, by means of overhead pipes.

In 1956, the average output from 32 pits was 4,300 cu.ft. per ton of coal. This might be compared with the estimate of 2,000 cu.ft. per ton in Great Britain, said Professor Allcut. The revenue derived from the sale of methane was large, but so also was the investment required. Nevertheless, it was expected that methane draining would ultimately be adopted in 90% of the Japanese mines. Indirect advantages were also derived from the reduction in the amount of ventilating air required and the increased safety of mine operation.

Professor Allcut's survey of the papers concluded with a section on organisation and control.

In the discussion which followed Mr. Longden contributed some comments on the merits of compressed air in mining, a method which is being used increasingly in the U.K., and there were two contributions from France and one from the U.S.S.R. However, it was the contribution of Dr. A. C. Monkhouse, Acting-Director of Fuel Research, D.S.I.R., which was of most significance to the industrial coal users in Britain.

In Great Britain, he said, coal provided 85% of the energy requirements of the United Kingdom, and imported oil about 14%. The home consumption of coal in 1956 was 215 mill. tons. Of this 74% was burned, including about 7 mill. tons used in gas producers; the remainder was carbonised at gasworks and coke ovens to produce gas, tar, ammonia liquor and chemicals.

An analysis of the coal burnt showed that since World War II the industrial uses had increased, largely due to an increased use of coal for the production of electricity, which had risen from 24 mill. tons in 1945 to 46 mill. tons in 1956. The coal used directly for domestic purposes had declined due to the restrictions imposed in the war and post-war years, and the greater use of coke, gas, and electricity. If, however, the total fuel used in the home—coal, coke, gas and electricity—were compared in terms of the equivalent quantity of coal, the total amount was not materially different from that of the 1936-40 period. The restrictions on the purchase of household coal were removed in July, 1958, and it would be interesting to note whether it affected the pattern of coal consumption. Another factor would be the passing of the Clean Air Act, 1956, and the growth of smoke controlled areas.

Consumption Estimate

The size of the coal mined had changed. Since 1950 the amount of large coal had decreased from 61 to 47 mill. tons per year, and small coal had increased from 68 to about 90 mill. tons per year. This had been partly due to mechanised coal mining, the increased use of explosives, and the use of power loading machines. Small coal was largely used by the electricity industry, coke ovens, and to a less extent by general industry. The consumption of pulverised coal in Great Britain had risen from 3.1 mill. tons in 1930 to 27.9 mill. tons in 1955. Of this 27.9 mill. tons, 21.4 mill. tons were used by the public supply electricity generating stations, which was equivalent to 52% of their total coal consumption. It had been estimated that the consumption would rise to 35 mill. tons by 1960. The consumption of pulverised fuel in shell type boilers had increased from 277,000 tons in 1950 to 403,000 tons in 1955. One of the problems of burning small coal and pulverised coal was the grit and dust emission. With pulverised fuel burning, efficient dust arresters were a necessity, and modern practice was the use of multi-cyclones and electrical precipitation.

Dr. Monkhouse said that one outlet for the use of small coals would be their conversion to heating gas,

town gas, or synthesis gas. Most commercial gasifiers required sized coal, and what was required particularly was a gasifier using small coal that would operate under pressure, using oxygen. This could then be used for the manufacture of synthesis gas for the production of hydrogen or hydrocarbon oils. Under the ægis of the Ministry of Power a design study has been made showing the economic possibilities of the conversion of a low-grade coal into petrol, fuel oil and gas on the scale of 2 mill. tons of solid fuel, and the production of about 600,000 tons of liquid fuel and 60 mill. therms of gas. A gasifier working under a pressure of 25 atmospheres using steam and oxygen was envisaged, followed by a Fischer-Tropsch synthesis unit. A pressurised slagging gasifier was being developed by the British Coal Utilisation Research Association, the British Gas Council, and by contractors. Other commercial gasifiers for small coal at atmospheric pressures might prove suitable for the production of heating gas for coke ovens and steel works, or for localised industrial areas.

As the use of atomic power developed less coal than first envisaged might be required by the forward programme of the electricity generating industry, resulting in the liberation of small, high ash coal for which other uses would have to be found if an economic balance of the different sizes were to be retained.

The Trade Unions

by a Special Correspondent

AN engineer or a scientist or a salesman or an accountant in industry never works in a human vacuum. Indeed, he could not do his job if he did. He works in a setting of industrial relations, the proper functioning of which is essential to the success—indeed, even to the continuance—of his post. He cannot shrug his shoulders and say that trade unions, for example, and what they do, are no concern of his. They are of vital concern to him and affect his career, whether he is a member of a trade union or not, throughout his working days.

Sir Winston Churchill has said that the great power that trade unions now hold entitles them to be considered as a new estate of the realm, in company with the other ancient estates. The other estates of the realm can be called the Monarchy, the Clergy, the Lords and the Commons. In other words, trade unions have become so powerful in this country that they can, and do, materially influence the lives of all of us in all sorts of ways. They therefore compel our interest and no-one can successfully pretend that he lives in an ivory tower and is unaffected by them.

This interest has been accentuated by the recent spate of strikes in the metropolitan bus industry, in Smithfield market and in the London Docks. The effects of such strikes on the cost of transport, in the grievous loss of perishable foods, and in the exasperating delays in the importing and exporting of vital materials cannot be confined to one part of the country. They are bound in time to be felt throughout the country and throughout industry.

When we examine the given reasons for this outcrop of strikes, they do not appear to justify inflicting the considerable inconvenience and loss to all parties which they occasioned. There seems to have emerged a disturbing lack of competence on both sides in the handling of human relations in industry. The whole business of the bus strike in London, for example, has reflected little credit on the union, or its members, or on the Transport Executive.

The maintenance of right principles is as essential in the industrial relations field as in any other. But the striking of rigid attitudes and barricade posturing are not necessary concomitants of such maintenance. Indeed, they do a great deal of harm and greatly aggravate the resumption of negotiations. The necessity for face-saving should be avoided at all costs in this difficult field.

Fifteen hundred men decided during the strike that they wanted no more to do with such an industry and sought their bread and butter elsewhere. Many of us will have a sneaking sympathy with their action.

To most people, it is not altogether clear why the bus strike was ever called. Why it is not clear must be of interest to all of us, because it appeared to be an unnecessary disruption of economic society. Let us consider the facts. The Industrial Court—an impartial court on which sit representatives both of employers and of workers—to which both sides agreed to refer the dispute, made an award. It is unheard of for either party to flout its findings. True, there is no legal compulsion to accept them. But there is a moral obligation and this moral obligation is normally unquestionably accepted by both sides to the dispute. But the Union in this case not only refused to accept the award but initiated an official strike in defiance of it.

Furthermore, the strike was not against a bloated capitalist fat with profits. It was against a nationalised industry which cannot anyway make a profit, in the ordinarily accepted sense of that word. London Transport is a publicly-owned organisation providing a vital service to the public. In other words, public ownership, in this case, did not protect the public from being punished on behalf of the interests of a relatively small group of people—some thousands of busmen.

It is true to say that this is the very negation of the principle which led the old socialist pioneers to agitate for the nationalisation of industry. That principle was to prevent the public from being exploited by the unscrupulous profiteer. Would it be uncharitable to suggest in the case of the last strike that the public were being exploited in the interests of a very small section of the workers.

Also from the point of view of the union itself, it seems odd that it should spend the vast sum of over £1 mill. in strike money on a very small number (14,000

Green Line busmen) out of its 1.5 mill. members. Furthermore, the strike imperilled the livelihood of the busmen. Apart from the 1,500 who left the bus industry during the strike, many more will have to be made redundant. The London Transport Executive had a growing deficit. An announcement was made that there would be a cut of 10% in the services as soon as the strike was over. As the result of the strike, it may have to be much higher.

Then there was the dangerous attempt to extend the strike and cripple the economic life of London. It looked as if the union were about to challenge the democratically-elected Government of the day. The union sought the help of the Trades Union Congress. The latter, to its credit, recoiled from such a struggle. It has turned its back permanently on the tactics of the 1926 General Strike. No nation can tolerate the existence of two governments at one and the same time.

No democracy can tolerate a non-elected minority trying to dictate to the Government of the day merely because it does not like its policy. The attempt to call out the petrol drivers and possibly the Underground power operators, members of the same union, was an attempt to cripple London and would be bound to lead to a head-on clash with the Government, one of whose paramount duties is to see that the economic life of the country continues.

Concurrently with the bus strike, there was the fatuous strike at Smithfield. It was fatuous because its origins did not lie in the docks at all. It arose from a rejection by the employers at Smithfield Market of a claim for a wage increase for their meat lorry drivers. This strike spread first to the market porters and then, by way of the riverside cold stores, to the London Docks. For six weeks, the union executive appeared to take no steps either to recognise the strike or to stop it. It was both an unofficial strike, yet uncondemned by the union.

Now it is the plain duty of any union, whose members receive their livelihood from an industry to co-operate at all times with the employer to increase the efficiency of the industry. The need to rationalise the labour force at Smithfield is urgent. There is an inflated labour force there maintained by an extensive system of restrictive practices in an industry which is a rigid union closed shop. The porters and strikers at Smithfield, by coming out on strike, defied their union and broke their contract of service with the employer. And they were allowed to get away with it.

Expensive

The last absurdity is that neither party has gained anything from the bus strike. The union has lost £1½ mill. in strike money. The busmen have lost £3½ mill. in wages. The London Transport Executive has lost untold millions in revenue. There is some gain in the fact that the strike has demonstrated that it is a very expensive thing to flout the award of an industrial court.

In its fight against inflation—and what sane person can be against it?—the Government seems to be succeeding in keeping down wage and salary increases to about 3-4%. The loss of revenue to the London Transport Executive has accentuated and expedited the paramount need for the London Transport industry, if it is to pay its way, to rationalise the bus industry in the metropolitan area. But all this could have been done without strike action.

Two further gains are that it is clear that no union can successfully challenge the legitimate authority of the Government and that there is a limit to which you can push the public around. The public have showed a calmness and an adaptability to changed circumstances which must have had a sobering effect on the militant extremists.

What is of paramount importance is what the men themselves think of the results of the strike.

Fifteen hundred men came to the conclusion that the bus industry held no future for them and departed. Many more will lose their jobs owing to the unavoidable necessity of cutting down the bus services by at least 10%. The severe loss in wages can probably never be really recouped. The loss of perishable food in the docks and the unavoidable need for the elimination of the restrictive practices in Smithfield are bound to have adverse effects on the pockets of the employees in those industries as well.

Disaster

Will they still go on listening to the wild men, or will they realise that their counsels will lead them only to disaster? There is in the docks an unofficial organisation of left-wing militants called the Joint Port Liaison Committee, whose object is to obtain any demands by more direct methods than those used by their official trade union organisations. How long are the dockers going to allow themselves to be led by the nose by such an organisation? The future economic prosperity of the country and the proper functioning of democracy will greatly depend on the answers the men themselves will give to questions such as these.

It is probably generally accepted in this country that there can never be a general denial of the right to strike, and that employees have the right to combine for their own protection. This right has been enshrined in our legal system as one of the liberties of the subject.

But most thinking persons would also agree that the strike weapon is an ultimate sanction to be used only with due regard to the rights of others, and especially to the rights of innocent parties, such as the general public. But, as will have been seen, the last bus strike was conducted in defiance of these principles. There has consequently been a great deal of anxiety in the minds of the public about the enormous power and privileges enjoyed by the trade unions in this country today.

It has been said that when the barons had completed their task of protecting the countryside against raiders, they used their power and privilege to exact tribute from the countryside. They were the last class to have private armies before the advent of trade unions in their present setting. There is now the obvious danger that the trade unions, having used their forces for the protection of their legitimate interests, covered by legislation of more than 50 years, are now using their forces in furtherance of a supremely non-Socialist principle.

> 'That they should take who have the power
> And they should keep who can.'

In the next article, it is proposed to deal with some suggestions for the re-consideration of such powers and privileges in the interests both of the unions themselves and of the nation as a whole.

Automatic Control of Liquid Levels

by

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IN many industries, as well as in certain domestic and civil engineering projects, it is often necessary to employ devices for maintaining the surface of a liquid in a container at a constant level. A primitive, but widely used, example is to provide an overflow pipe at the required level in cases where the fluid has little or no commercial value, or where the recovery of the excess is practicable. Such an arrangement is usually, but not invariably, supplemented by float-valve control on the inlet duct. There are many cases, however, where the adoption of such simple methods is not possible for various reasons, as, for example, the positioning of the vessels or the nature of the liquid. In industrial applications, the maintenance of a constant liquid level usually entails pump control or valve operation on the inlet and/or outlet of the pipe connections to the containing vessel. The essential principle is to provide means whereby the flow of liquid to or from the vessel can be controlled by the effects which are produced when its level tends to rise or fall from the pre-determined position. With pump- or valve-control, the means of doing this include:

(a) Float control.

(b) Floatless control.

(1) Electrostatic capacity methods.

(2) Electrical conductivity methods.

(3) Heat transfer methods in conjunction with electrical operation.

The Simplest

Float control. The simplest form of float level-control is the familiar floating ball device used in domestic water-heating systems and similar installations, in which the float is attached directly to the inlet water valve, the latter being kept shut by the buoyancy of the float, and allowed to open to admit water or other liquid as the level falls. A tank overflow pipe is provided at a level slightly higher than that required in the tank, and acts only as an emergency measure to avoid overflow of the tank itself in case of breakdown. Such a system is perfectly satisfactory for many purposes, but it has certain limitations. It needs the constant application of pressure of liquid at the inlet valve, whether the latter is open or closed, and, although economically adaptable to the purposes for which it is generally used, it may be wasteful in power if applied to many large scale purposes. It is, in fact, not so much a means of maintaining a constant level, as of assuring a reasonable amount of liquid is held in reserve during intermittent periods of withdrawal. The system is so designed that the rate of filling is generally considerably less than that of withdrawal, and the tank is of such a capacity as to serve as a reservoir which is re-filled during the period following withdrawal.

For many works requirements, this is not what is wanted, but rather that the reservoir is to be filled and emptied by pumping and/or gravity. The rates of inflow and out-flow have to be regulated so that the level of liquid remains approximately constant over long periods of working, by being maintained at some position between pre-determined high and low limits, the distance apart being small or comparatively large according to requirements. Some form of device is then necessary whereby a standing pump or valve can be operated to deliver liquid as soon as its level falls as far as the lower limit, and to withdraw liquid when the level rises to the upper limit. It is obvious that, with high flow-rates, or with close differences between high and low levels, there will be correspondingly more frequent pump or valve operation than with low rates or large level differences. With float-control methods, although purely mechanical devices can sometimes be employed, it is generally much better to control the valve or pump operation electrically, by arranging for contacts, to be made when the float reaches the particular levels. In cases where the specific gravity of the fluid varies greatly from time to time, the depth of immersion of the float will vary correspondingly, and this will affect the levels at which the controls operate.

Overcoming Difficulties

This is not usually of importance, but cases may arise which present difficulties where small differences between high and low marks exist. A tilting tube mercury type of switch is very convenient for this work, and may operate either in the main circuit or through a relay. In the Girdlestone Floatswitch, the single-pole mercury switch consists of a sealed tube partly filled with mercury, carried in a phosphor-bronze cradle, and is actuated by a smooth and positive spring-controlled over-centre tilting movement. The switch is mounted in the horizontal position. The float is made of expanded polystyrene, copper, or stainless steel, the switch arm being operated by a flexible cable with adjustable stops and counter balance weights.

Floatless control. Such systems can often be employed where the use of a float presents difficulties, as, for example, in tanks which have to be kept sealed or are in inaccessible positions. These methods involve no moving parts in the tank itself, and their operation is unimpeded by sludge or debris. There is no submergence error, and control can be obtained within fine limits.

Electrostatic capacity methods. The principle of

electrical capacity is employed to detect the approach of any substance to, or recession from, a fixed probe inserted into the container, and the consequent change in capacitance can be made to actuate a relay which in turn can switch in a stop or start pump or valve mechanism. In the 'Tektor' level control, which consists essentially of an electronic unit and a probe, this principle may be applied to the high and low level control of liquid in a storage tank. The liquid does not need to come into contact with the metal of the probe, so that the latter can be covered with insulating and protective material. The electronic unit employs a single valve in an oscillating circuit, the anode current of which varies with change of oscillatory amplitude. This amplitude is controlled by the effective capacity of the probe and the change of anode current is arranged to energise the relay. Hence, the relay is in one of two positions, according to whether the liquid is adjacent to, or remote from the probe.

Electrical conductivity methods. Many liquids used industrially are reasonably good conductors of electricity and this property is made use of in level-control systems. Oils in general are, of course, precluded from this category owing to their non-conductive properties. Water containing the usual small quantities of dissolved electrolytes such as normally occur in town or works supplies, ammoniacal liquor and aqueous chemical solutions are applicable to the method.

Trouble-free

The 'Noflote' system of pump control, designed and supplied by Messrs. Evershed and Vignoles, Ltd., is a very convenient and trouble-free method for the automatic operation of pumps, valves, and sluice gates. Two metal electrodes act as dipping rods, and a special relay is used, operated by mercury switches. Standard components may be assembled for carrying out a variety of duties by modification of the relay circuit. As an example, a pump may be operated in conjunction with a tank, well, or sump into which liquid may be running either continuously or intermittently, as, for example, from gasworks condensers or ammonia scrubbers, in such a manner that the liquid is maintained between pre-determined levels. Fig. 1 shows the circuit employed for the control of a drainage pump. The two electrodes, which are carried on insulating bushes, project downwards into the liquid so that their lower ends are at the two levels required. The relay connections are on the electrode terminals. When the liquid in the tank rises as high as the upper level, an electrical circuit is closed, and this operates the relay. The latter operates a solenoid, or pilot coil, of the automatic starter of the pump. Although many pumps are driven by an electric motor, this prime mover is not essential to the system. For instance, with a steam driven pump, another solenoid can be incorporated in a specially designed steam valve which can be opened or closed as required by the relay. Referring to Fig. 1, the relay unit contains a transformer which isolates the operating circuit from the A.C. mains, and reduces the voltage to 30-60 V. With a 30 V secondary, the relay will operate through a water resistance of 75 ohms between the electrodes, while, with 60 V the resistance may be as high as 300 ohms. The energy consumption is negligible, being of the order of about 6 W.

When the liquid rises and makes contact with the upper, or 'start' electrode, a circuit is completed through the transformer and solenoid, raising the plunger in the latter, and thereby causing the mercury switches A and B to close. Switch A actuates the pilot coil of the motor starter, thus setting the pump in

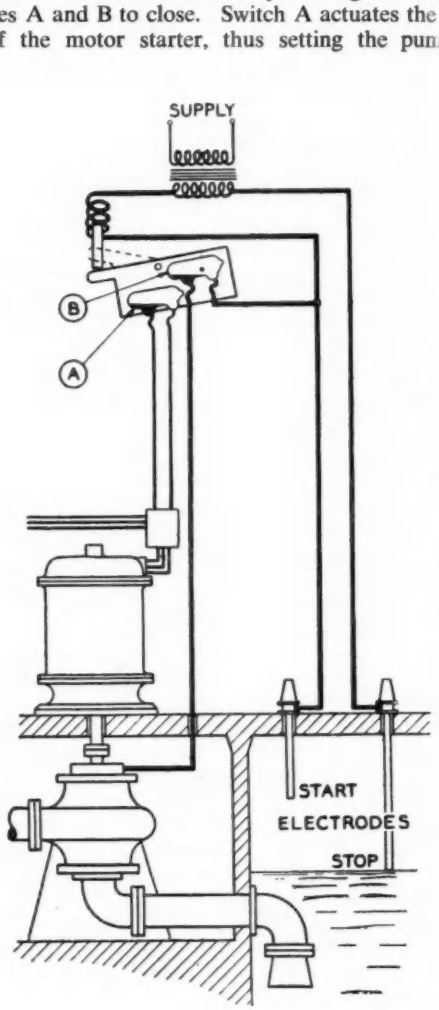


Fig. 1.

operation, while switch B completes a 'hold on' circuit to earth, so that the pump continues to run after the level of the liquid falls below the upper electrode, and until it is clear of the lower, or 'stop' electrode. The plunger of the solenoid then drops, opening both mercury switches, and stopping the pump.

Heat-transfer methods employing electrical operation. The principle of the heat-transfer method of level control is that heat is dissipated more rapidly through a liquid than through air, gas, or vapour. It is applied to the control of electrically driven pumps, dealing with non-corrosive liquids, in cases where the interior of the vessel is not readily accessible. The switch operating the pump motor is a thermal instrument which acts in accordance with the heat transference between a sensitive element and the liquid in the vessel, or the sensitive element and the gaseous medium above it. There are no moving parts within the container, and it is particularly useful for steam boiler application where it

can be used to control the operation of the feed-water pump or to actuate a low-water alarm, etc.

The Teddington floatless liquid level equipment acts on this principle and is made in several models for different applications. The control unit comprises two probes set close together in the switch head, each probe consisting of an invar steel rod in a brass tube. For maximum sensitivity the unit should be mounted with the probes horizontal, the two elements being at the same level and at the level required in the liquid. Electrical connections can be arranged as required to enable the switch to make circuit on either a fall or a rise in liquid level. In each of the elements, the invar steel rod, which has a very small thermal coefficient of expansion is connected to the brass tube—a much higher coefficient of expansion—at one end only. Use is made of this difference in expansion coefficient, to operate the switch. The invar steel rods bear on either end of a pivoted switch level. One of the rods, provided with a small electrical heater wound around it, is continuously heated, so that one probe is always hotter than the other. The other probe works in opposition to compensate for changes in the ambient temperature. When the probes are immersed, heat is dissipated very rapidly, and the difference in temperature between them is insufficient to operate the switch. With a fall in liquid level, however, the probes are no longer immersed, and the heat is dissipated at a much slower rate, causing a sufficient difference in temperature between the probes to put the switch into operation by the movement brought about by differential expansion.

The Teddington Mark WX/AD/I/F or S is suitable for controlling the water level of steam boilers with a maximum steam pressure of 120 p.s.i., and the control of non-corrosive fluids at atmospheric temperature at a pressure of 350 p.s.i. The liquid level can, in many applications be controlled within approximately ½-in.

This limit will be dependent on the rate of liquid efflux since the switch will operate in 8 to 12 seconds of level change. In cases where rapid restoration of level is not desired, or not essential, another model, the Mark III/WX/AE/1/F or S, can be used in which the switch does not operate until 32 to 38 seconds after the change of level. This model is not recommended for use with steam, and should not be employed where the maximum temperature exceeds 250°F.

It will be evident from the foregoing descriptions of liquid level controllers, that, in most cases, control is desired and operated between two levels which may be close, or comparatively widely separated. In some cases, however, as for stocktaking purposes, or during investigational work, it may be necessary to know the exact level of the liquid at some given instant. For this purpose, level gauges, fixed either directly on the reservoir, or working on a remote indicating system are used. With many forms of level control units, it is possible to incorporate instruments operated by the controller itself, which will provide either spot indications or permanent graphic records.

Ministry of Power Issues Statistical Digest, 1957

THE ninth issue of the Ministry of Power Statistical Digest (H.M.S.O. 37s. 6d.) is in a similar form to earlier issues but most of the tables relating to accidents and industrial diseases in the coal mining industry, previously included in the Digest, are being published in the Appendix to the Annual Reports of the Chief Inspector of Mines. There has been some re-arrangement of tables, particularly in the gas and electricity sections.

The Digest incorporates historical series going back over a considerable number of years for main items in respect of each of the fuel industries. A new feature in table 6 illustrates the changing pattern of the country's total energy consumption by types of fuel for each year since 1923.

The usual tables relating to productivity and manpower in the coal mining industry are included. Owing to changes which have been made from time to time in the classification of manpower under various headings, the figures are not always comparable year by year. For this reason, in addition to showing the statistics as recorded, tables 7, 9-12 and 27 give numbers employed, output per manshift, etc., adjusted to make them comparable, so far as possible, with the current basis of recording. Because of the lack of precise information as to the effect of the changes, particularly when carried back to earlier years, the estimates under the heading 'Adjusted' should be accepted with reserve.

The Solid Fuel Distribution section has been considerably expanded and now includes a more detailed analysis of the disposals of home-produced coal. A new table is also included showing merchants' disposals of house coal in each region of the country year by year since 1949. Another additional table gives details of the availability and consumption of gas coke for each year since 1948.

The Petroleum section includes a new table (table 100) showing the imports of crude oil according to country of origin.

The Ministry of Power assumed responsibility for iron and steel on January 16, 1957, but the Digest does not include statistics for this industry. They are to be found in 'Monthly Statistics' and 'Annual Statistics' published jointly by the Iron and Steel Board and the British Iron and Steel Federation.

U.S. Publications

THE American Gas Association now has available for distribution copies of its 1958 editions of 'Gas Facts' and the 'Gas Data Book.' The former publication, its annual statistical year book, presents comprehensive information on all phases of gas industry operations during 1957 and earlier. The 'Gas Data Book' is a pocket-sized summary of the most salient statistics regarding the operations of the industry for convenient reference.

Watson House Reports on Modified Fairweather Calorimeter

THE increasing use of gases of high calorific value, such as butane, methane and refinery gases, for supplementing the output of conventional plant, has created many practical problems, among them the accurate determination of their calorific values. A Fairweather calorimeter has been modified at Watson House to enable it to be used on gases of calorific values from 420 to 4,600 B.t.u. per cu.ft. without altering the normal temperature rise or changing the recorder, apart from fitting different scales. The modifications can be divided into two main sections. First, the modifications to the escapement, water orifice and mercury switch to alter the range of the instrument, and secondly, the alterations made to the burner and combustion air system to give a satisfactory flame with different gases.

It is obviously advisable to have an instrument that can be used throughout the whole range of calorific values without complicated alterations. The Fairweather recorder (Elliot pattern) has a useful range of ±15% from the datum, so that several alterations are necessary to cover the practical calorific value range likely to be encountered. In practice this will be from about 900 to 2,200 B.t.u. per cu.ft. There are three ways in which alterations may be made to this recorder without altering the normal temperature rise of the water flowing through the heat exchanger:—

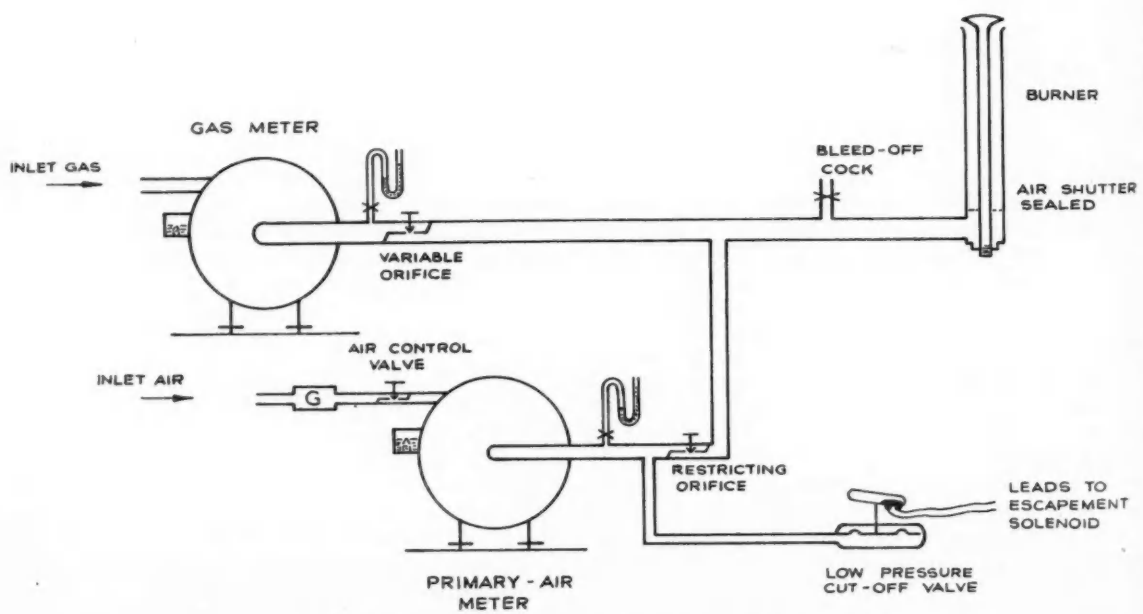
(i) The escapement can be exchanged for one fitted with a different gear ratio.

(ii) The water flow may be altered by changing the controlling orifice.

(iii) The mercury switch fitted to the impulse clock pendulum can be replaced by one that makes contact every two seconds instead of every second.

Escapements with 2:1 and 4:1 gear ratios were made by Scientific and Projections Ltd. and after some 'teething' troubles proved satisfactory. However, the time taken to replace one escapement with the other ruled out this method of changing the range of the instrument. Changes in water flow may be made by fitting different orifices and this can be done while the instrument is working. The upper flow limit is fixed by the volume of water that will pass through the calorimeter with the head available and by the heat input to the burner which, if increased appreciably above the normal figure, may cause trouble because of insufficient air for combustion. The normal type of mercury switch fitted to the clock pendulum sends an impulse to the escapement solenoid every second. This switch was changed during some of the tests for a different pattern, which enabled an impulse time of 2 seconds to be used.

This had the effect of doubling the gear ratio of the escapement. These alternatives were considered and Table 1 was prepared, giving four settings to record calorific values from 850 to 2,300 B.t.u. per cu.ft. These settings were to be achieved by using four water orifices of 1,000, 1,250, 1,500, and 2,000 cu. cm. flow every four seconds. If this system were used, the 4:1 gear escapement (or alternatively the mercury switch giving a two second impulse, together with the 2:1 escapement)



Modified mercury switch for Fairweather pendulum clock.

would be used on all ranges, and the only alteration necessary would be the changing of the water orifice.

TABLE 1

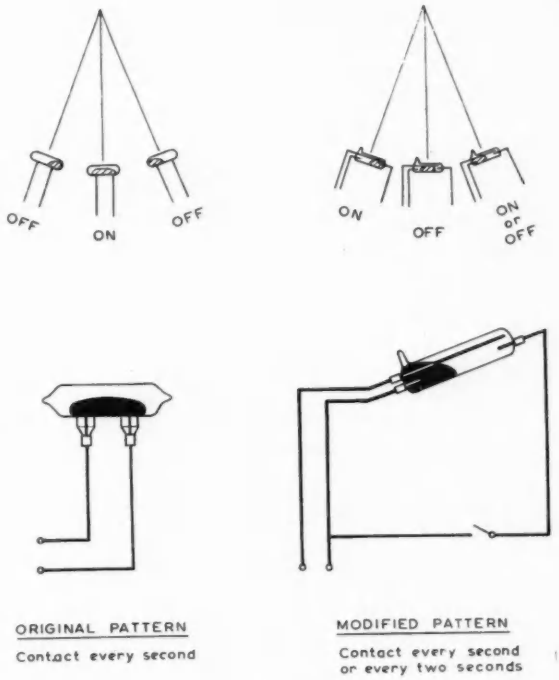
Range No.	Gas rate per cu. ft. per hour	Heat input B.t.u. per minute	Water rate cu. cc. per 4 minutes	Chart centre line per B.t.u. cu. ft.	Chart range per B.t.u. cu. ft.
1	1·25	21	1,000	1,000	850—1,150
2	1·25	26	1,250	1,250	1,050—1,450
3	1·25	31	1,500	1,500	1,250—1,750
4	1·25	42	2,000	2,000	1,700—2,300

It was hoped originally that the existing pattern burner could be used without modification other than a reduction in size of the injector orifices. This proved insufficient, however, to give a satisfactory performance for refinery gases of high calorific value for the following reasons:—

1. Using the same heat input with a gas of high calorific value meant that the gas rate was lower. This reduced the burner pressure, although the higher specific gravity compensated for this effect to some extent.
2. The burner pressure can be raised by increasing the loading of the Fairweather oil governor, but this is limited by the oil seal which blows at pressure above about 1.2 in. w.g.
3. The momentum imparted to the gas stream, even at gas pressure of 1.2 in. at the burner, was insufficient to entrain enough primary air for satisfactory combustion. Indeed, part of the gas tended to flow out of the air shutter and this, as well as giving a low reading, eventually caused the burner to light back.

Pressure Fluctuations

It was therefore decided to seal off the aeration ports and provide primary air independently, using a small electric pump. This introduced further problems. Chief among these was the effect caused by small pressure fluctuations as the drum of the gas meter revolved. These oscillations do not normally exceed .10 in. w.g. but with a maximum gas pressure at the burner of only .15 in. w.g. (with no primary air flowing) considerable variations occurred in the gas rate. Using a fixed primary air rate the burner flame became alternatively over- and under-aerated during the course of a meter revolution and went out several times. It was impossible to remedy this by reducing the size of the injector holes and using a higher gas pressure at the burner, since with the high primary air rate the total pressure at the burner was near the limiting pressure of the oil governor. This difficulty was eventually overcome by fitting a restricting orifice after the gas meter but before the air inlet, and enlarging the burner injector holes to about twice their normal diameter. These two modifications had the effect of increasing the pressure at the meter outlet, making the effect of small oscillations insignificant. Further, since the pressure at the burner was lower the oil governor loading could be reduced. It was found that with gases of high calorific value, although the primary air: heat-input ratio was set at the same value as that required for gases of 500 B.t.u.



Modified Fairweather burner system.

per cu.ft., the burner flame was still luminous. This is to be expected for hydrocarbon gases and tests were made to discover the optimum primary air rate for a wide range of calorific values. To prevent incomplete combustion it was found necessary to alter the air rate whenever an appreciable increase in calorific value occurred. A graph was plotted giving the recommended primary air rate for the appropriate calorific value range, but such a graph is only an approximate guide, since variations in the composition of refinery gases may require a change in the primary air rate to give the optimum value, even though the calorific value remains approximately constant. The use of an independent primary air supply necessitated the addition of a safety device to guard against air failure. A low pressure cut-off valve was, therefore, arranged in the air line just before a restricting orifice, which ensured that a pressure of 2 or 3 in. w.g. was available to operate the diaphragm. The mercury switch of the cut-off valve was fitted in series with the wiring to the escapement solenoid so that in case of failure of the air supply the gas supply to the burner would also cease. In addition, a back pressure valve was fitted between the gas meter and the air inlet, but the pressure required initially to open the flap valve greatly increased the difficulties of starting the instrument so that this valve was eventually removed.

Comparisons

Tests on the modified calorimeter were made by comparing the recorded results with the calculated values and with determinations from the Boys section of the Fairweather and a non-recording Boys calorimeter.

Humidity and radiation corrections were ignored when calculating the corrected Fairweather readings in accordance with the normal procedure, but the Boys tests were corrected for these effects where necessary. The results are given in Table 2.

TABLE 2

Test gas No.	Calculated c.v. B.t.u. per cu. ft.	Corrected Boys c.v. B.t.u. per cu. ft.	Mean of corrected Fairweather readings B.t.u. per cu. ft.	Fairweather error*	
				B.t.u. per cu. ft.	%
1	2,270	2,257	2,253	− 4	− ·2
2	1,690	1,675	1,675	—	—
3	1,500	1,496	1,498	+ 2	+ ·1
4	1,330	1,329	1,330	+ 1	+ ·1
5	2,200	—	2,196	− 4	− ·2
6	960	—	965	+ 5	+ ·5
7	1,335	1,342	1,340	− 2	− ·1
8	879	862	873	+11	+1·3

* Compared with the Boys' results except for gases 5 and 6 for which the calculated figure was used.

The humidity corrections determined for each of the above test gases were all less than 5 B.t.u. per cu.ft. since the primary and secondary air temperatures were maintained within 2° or 3°F. of the inlet gas and effluent gas temperatures. Should any of these temperature differences increase, however, the humidity correction may become too large to be ignored when the calorimeter is in use on refinery gas. For example, with an effluent gas temperature of 56.5°F. and an inlet air temperature (primary and secondary) of 61.5°F., the calculated humidity correction was −9.0 B.t.u. per cu.ft. for a refinery gas of 1,350 B.t.u. per cu.ft. and −1.5 B.t.u. per cu.ft. for a gas of 500 B.t.u. per cu.ft. Provided the heat exchanger is maintained in good condition and free from soot, the temperature of the effluent gases will usually remain within a few degrees of the inlet gas and secondary air temperatures. If the meter used for the primary air is of the water jacketed pattern, part of the inlet water flow can be diverted to keep the primary air at the same temperature as the inlet and outlet gases. Any radiation errors caused by heat lost or gained from the external surfaces of the calorimeter are unaffected by the type of gas burning in the combustion chamber provided the heat input is similar. The usual methods should be used for maintaining the inlet water temperature as near to 3°C. below the room temperature as possible.

Satisfactory Alternative

Practical tests with the various methods of changing the water and gas rates on the Fairweather, showed that a combination of differing water orifices with the 4:1 escapement was the simplest way of obtaining the required calorific value range. The double contact mercury switch, in combination with the 2:1 escapement and the differing water orifices, was a satisfactory alternative and had the additional advantage that the change from a gas of 1,000 B.t.u. per cu.ft. to a gas of 2,000 B.t.u. per cu.ft. could be carried out almost instantaneously. Adjustment of the variable orifice setting and the primary air rate were, of course, necessary after every change of range. In general, the operation, maintenance and checking of the modified Fairweather while in use with gases of high calorific value is very similar to the routine for the standard type of instrument. It is necessary to check the primary air rate daily and adjust the water line of the air meter at regular intervals. Close attention will have to be paid to the water level of the gas meter, as this will be working with a higher outlet pressure because of the restricting orifice. Any differences in the outlet pressure caused by altering the range, or any changes in specific gravity, will alter the water level of the meter. The higher operating pressure of the meter also means that the gas is being measured at a pressure significantly above atmospheric and a small error is thus introduced. Assuming a working pressure of .7 in. w.g. the error will be equivalent to above .2% of 4 B.t.u. with a gas of 2,000 B.t.u. per cu.ft. An allowance can be made for this, if thought necessary, when checking the apparatus. Different scales have to be used for the recorder, dependent upon the calorific value range, and care must be taken to ensure that the correct water orifice is fitted for the indicated range. It is of interest to note that with the proposed escapement, mercury switch and water orifices, it is possible to extend the working range of the Fairweather recorder to cover calorific values from 420 to 4,600 B.t.u. per cu.ft. without appreciable loss of proportional accuracy.

Any Mk. 1 or Mk. 2 Fairweather can be modified and the only extra items of equipment necessary are:—

1. A water jacketed meter for the primary air supply.
2. A small air pump of up to 20 cu.ft. per hour capacity at 3 in. w.g.
3. A burner with the air sleeve sealed.
4. A 4:1 gear escapement.
5. A set of 1,000, 1,250, 1,500 and 2,000 cu. cm. per four minutes water orifices.
6. Three $\frac{1}{8}$ in. needle valves for restricting orifices.
7. A low pressure cut-off valve.

Once this apparatus has been assembled it is less than an hour's work to convert the Fairweather from use on conventional gases to high calorific value gases and vice versa.

Purchasing Lectures

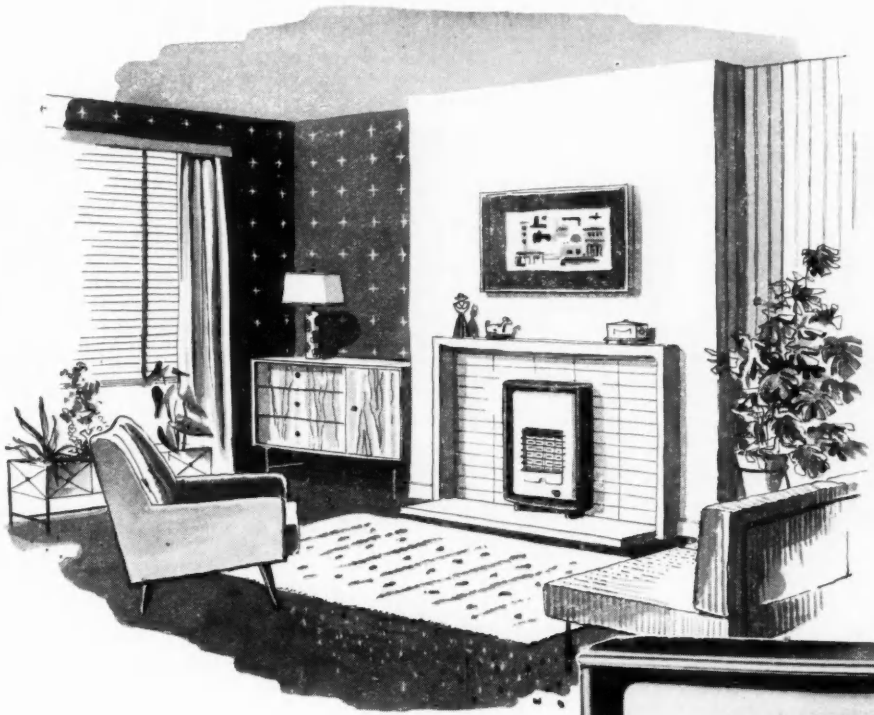
'THE proceedings of the First Advanced Purchasing Course held at Christ Church, Oxford, April, 1958,' is the title of a booklet published by the Purchasing Officers Association, which reproduces the full text of the lectures given by Professor Howard T. Lewis of the Graduate School of Business Administration, Harvard University.

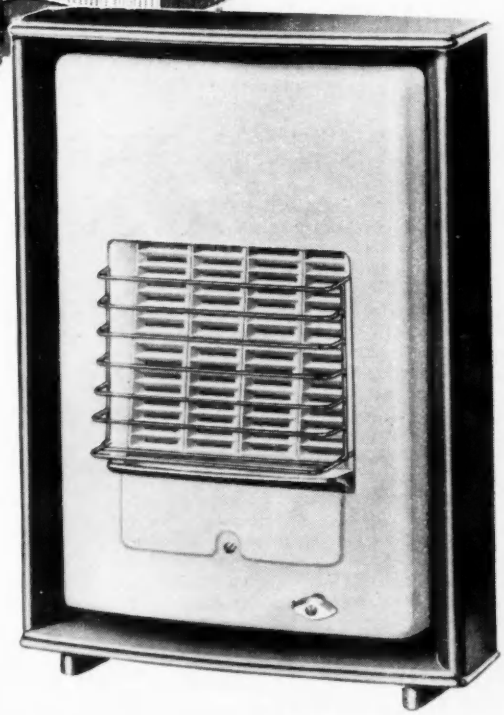
In his lectures Professor Lewis deals with the increasing importance of purchasing as a management function in an age of automation, computors, and operations research, and with the latest American techniques applied to forward buying, value analysis, vendor relations, and purchasing performance evaluation.

Short papers on each of these subjects by British authorities are also included, together with individual comments on the lecturer's points and his replies.

Three very detailed case-problems are presented, followed by Professor Lewis's analysis of their solution, and the booklet crystallises the very latest thinking on the most up to date practical procedure in some of the most important industrial purchasing problems. Address of the Purchasing Officers Asociation, is: Wardrobe Court, 146A, Queen Victoria Street, London, E.C.4. The booklet costs 10s. 6d., post paid.

NEW WORLD Space Heaters





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NEW WORLD
RADO-VECTA

★ There is no more efficient Convector Gas Fire than the RADO-VECTA. Due to the "total head break", this efficiency is almost unaffected by wide variations in chimney pull.

★ New box type Rado Radiants are fitted and these give a brilliant appearance when heated. The RADO-VECTA is available in any combination of the following colours:—
Outer Front: Gold, Nubian, Bronze or Black.
Inner Front: Gold, Silver or Cream.

★ Rating: 16,000 B.t.u./hr., 3-position tap, igniter and governor.

NEW WORLD
PRODUCT OF Radiation Ltd

Space Heaters

RADIATION GROUP SALES LIMITED, 7 STRATFORD PLACE, LONDON, W.1. MAYfair 6462

Giant bulldozer is as easy to drive as a car

WEIGHING almost three times as much as a London bus and nearly comparable in size, a £20,000 400 horsepower Model 380 wheeled Michigan tractor bulldozer was landed at Surrey Docks recently and driven direct under its own power 45 miles to Michigan (Great Britain), Ltd., Camberley, Surrey.

For maximum traction wide base tubeless tyres are standard equipment. These tyres are almost 8 ft. high and power steering coupled with full hydraulic operation is claimed to make the machine as easy and effortless to handle as a private car.

Trade News

The 380 has a working weight of almost 35 tons, and for heavy duty earth moving operations is fitted with a 14 ft. dozer blade with a 20 ft. blade available for coal handling and light materials. Hydraulic controls provide positive down pressure for heavy dozing and the blade can also be tilted by means of a double acting tilt cylinder to pry loose rocks or stumps.

Both ends of the blade are fitted with replaceable side cutting edges which enable the tractor to slice roots preparatory to felling trees. The machine carries a swinging drawbar fastened to the centre of an extra heavy frame well below the centre of the wheels for fast, easy connection of a sheep's foot roller, scraper or any other equipment to be pulled.

The 380 pictured above was ordered for civil engineering contracts in the Midlands.—*Michigan (Great Britain), Ltd., 3-5, Charles II Street, St. James's Square, London, S.W.1.*

FULL-SIZE MODERN COOKER AT MODEST PRICE

WITH the introduction of the No. 112 Talisman cooker, R. & A. Main, Ltd., have made available a modern, full-size appliance at a very modest price.

The Talisman is equipped with three high-speed boiling burners, large quick-heating grill and family size oven; it incorporates flash-tube oven ignition, pre-set simmering taps to all boiling burners, Mainstat automatic oven temperature control and forward venting flue.

Design of the Talisman is compact and modern and special attention has been paid to ease of cleaning. All corners are smoothly rounded and the hotplate can be dismantled in a few seconds.

Construction is principally of sheet steel, finished in high gloss vitreous enamel throughout. Colour finish is cream with black pan supports and burners and grey mottled oven interior.

The modern short splashplate is also of sheet steel and finished in cream vitreous enamel. Tap fans, oven door handle and Mainstat control knob are cream plastic.

All taps are safety type which must be pressed in against a spring pressure before they can be turned on. The quick heating grill is fitted with special heat-resisting frets and a deep hood to ensure rapid, even toasting. The grill pan is finished in black vitreous enamel and is supplied complete with a two-height close mesh wire grid.

The oven crownplate is also finished in vitreous enamel and is dished to act as a fixed spillage tray. The oven, which has a side-hinged door, is fitted with a single burner situated at the back.

Overall size of the Talisman is 20¾ in. wide by 22 in. deep by 45¾ in. high (to top of splashplate); height top to hotplate, 36 in.; hotplate, 20¾ in. wide by 19¼ in. deep; oven interior, 17 in. wide by 15¼ in. deep by 15¼ in. high.

Maximum heat inputs are—boiling burners, 12,000 B.t.u., grill, 13,000 B.t.u., oven, 10,000 B.t.u.

The Talisman is priced at £24 3s.—*R. & A. Main, Ltd., 48, Grosvenor Gardens, London, S.W.1.*

New Servis washer takes 9 lb. of clothes at a time

A GAS-ELECTRIC washing machine capable of handling 9 lb. of clothes at one loading has been introduced by Servis Washers, makers of electric washing machines since 1930.

The machine, which will obviously appeal where there is a great deal of household washing to be got through, has a powered 12-in. wringer of an exclusive Servis design which can be lifted off and stowed away in the base of the cabinet when not in use. This wringer automatically adjusts in the simplest manner to take the bulkiest of blankets or, say, the most delicate handkerchief, in any event giving the maximum wringing efficiency.

The wringer will probably be among the strongest of its selling points—it has a spectacular device whereby a safety bar throws off the pressure at a touch.

The 'Gas-Superheat' is a luxury machine available in a choice of contemporary two-tone finishes or in all cream or all-white.

The vitreous enamelled tub holds 9 gal. of water. The four-bladed heat resistant plastic agitator has a powerful yet gentle action, firmly pushing the water through the fabric with maximum cleansing effect. The tub is emptied automatically in two minutes by a pump through a special hose.

Easy-grip switches located on top of the machine operate agitator and pump. The ¼-h.p. motor is protected from overload.

The new Servis Gas-Super Heat Gas - Electric washing machine is the outcome of an order from the Continent.

Special design for easy cleaning in the home is a strong point—the accessible wringer, detachable wringer guards, removable agitator, smooth exterior finish with no dust traps.

After-sales servicing, which is handled by the Company's own service organisation with mobile engineers based on 20 depots, is facilitated also by the construction of the machine. The motor, gearbox and pump form part of a sturdy all-in-one cross rail assembly, ensuring safer transit and easier servicing.

The retail price, including purchase tax is £70, and a table-top surface is available at £2 10s. 5d.

Maximum heat input is 20,000 B.t.u. per hour.

Dimensions: *Height* 34½ in. without wringer, with wringer 44½ in. *Width* 23½ in. *Depth* 23¾ in. *Weight* 176 lb. empty.—*Servis Washers, Darlaston, S. Staffs.*

OVER 100 YEARS' EXPERIENCE IN THE CONSTRUCTION OF:-

GASHOLDERS, PURIFIERS, CONDENSERS, STEEL TANKS, HANDLING PLANT, MAINS, GENERAL STEEL CONSTRUCTIONAL WORK

SAML CUTLER & SONS LTD. LONDON

70 VICTORIA STREET, WESTMINSTER, S.W.1

PROVIDENCE IRON WORKS MILLWALL, E.14

ADVANCED MEDIUM DUMPER

AN advanced new medium-sized dumper is announced by the Chaseside Engineering Co., Ltd., to be known as the Chaseside High-Speed, Model D.5. It has a 13,500 lb. payload, two-way steering and controls, ten speeds in either direction and positive hydraulic hopper discharge. The D.5 has been designed to give new economies at every stage in dumper operation.

Ample power and fast acceleration come from a four-cylinder Fordson diesel engine which develops 61.5 b.h.p. at 2,250 r.p.m. Powerful four-wheel servo-assisted brakes match the performance of this machine.

Two-way driving controls reduce turn-round time on any job and are ideal for tunnelling work. The hopper has an extra large and low 'spotting' area for quick and accurate loading. A powerful hydraulic ram raises the hopper to its full tipping angle of 70° in less than six seconds. The hopper floats automatically back to the carrying position as the dumper moves off.

Full lighting is provided at the front and rear for site working at night.

The engine power is transmitted through a large torque capacity clutch, constant mesh gearbox and independently mounted transfer box which duplicates the speeds in either direction to a heavy duty two-speed differential axle (with vacuum operated change). This arrangement gives ten forward speeds and ten reverse. The operator can shift to a higher or lower ratio by touching the vacuum shift button.

A high safety factor has been designed into every component of this machine starting from a tremendously strong chassis specially contracted from large section rolled steel channels. Other highly stressed parts such as the hopper employ proven design techniques, good quality steel and welding to ensure a long operational life.

A square wheel base and a low centre of gravity make the D.5 one of the safest dumpers. Great attention has been paid in the design of the machine to the servicing and all moving parts are easily accessible.—*Chaseside Engineering Co., Ltd., Hertford.*

NEW GASMISER GIVES WARMTH —AND MAKES THE TOAST TOO!

THE new GasMiser, Model 'B,' designed for the average-sized room, gives a high radiant efficiency with some convected heat. It is thus designed so that it quickly gives a feeling of warmth by radiation. The radiant panel gives a bright, even, cheerful glow, with no uneven black spots even when the gas is turned down.

Solidly constructed for non-rust durability in the famous 'Cannalloy' frame, the Model 'B' blends into any fireplace or room whatever the décor. It is supplied with a built-in gas tap, flint lighter and specially designed dress guard.

The GasMiser, Model 'B,' is supplied complete with the new patented Cannon auto-toaster which gives you perfect toast at your fireside without extra fuel cost—piping hot thick or thin toast, crumpets, muffins, pikelets or tea cakes for your fireside meals. The toaster holds two pieces of bread which are automatically turned by simply opening and closing the toaster frame.

The GasMiser, Model 'B,' is now available, price £15 12s. 9d., including purchase tax, complete with toaster and instructions.—*Cannon (G. A.), Ltd., Deepfields, Bilston, Staffs.*

'ABBIRKO' GAS LOCATOR

ALTHOUGH primarily designed for tracing leaks in accessible pipes, the greatest demand for the 'Abbirko' gas locator has come from distribution departments for tracing underground leaks.

The principal advantage of our instrument over others working on the hot catalyst principle is that the sensitive element is in the probe head itself and for pipe surface work the aspirator bulb usually provided to draw a gaseous sample into the instrument is unnecessary; it is merely necessary to run the probe over the pipe surface.

For small escapes underground or in other inaccessible places, however, an aspirator is an advantage, and this has, therefore, been added, as shown in the foreground of the illustration.—*Abbott, Birks & Co., Ltd., 90-91, Blackfriars Road, London, S.E.1.*

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